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Hoffman, Frederick Ludwig

The sanitary progress and vital statistics of Hawaii

[Newark]

[1916]

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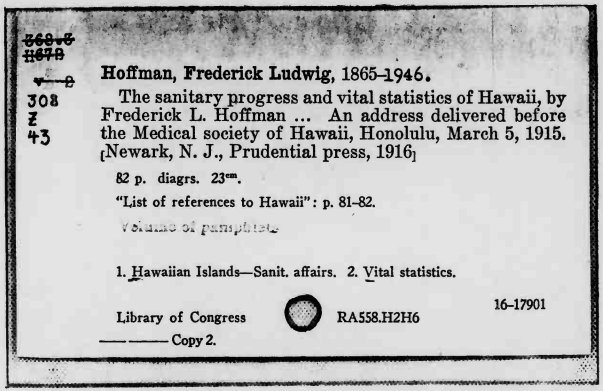
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THE SANITARY PROGRESS AND VITAL STATISTICS OF HAWAII

AN ADDRESS
DELIVERED BEFORE
THE MEDICAL SOCIETY OF HAWAII
HONOLULU, MARCH 5, 1915

PRUDENTIAL PRESS
NEWARK, NEW JERSEY
1916

THE SANITARY PROGRESS AND VITAL STATISTICS OF HAWAII

By FREDERICK L. HOFFMAN, LL.D.
STATISTICIAN THE PRUDENTIAL INSURANCE COMPANY OF AMERICA

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Mr. Applegate
April 12, 1917

1916
PRUDENTIAL PRESS
NEWARK, NEW JERSEY
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Box 43

May 21, 1917 AET

TO THE MEMORY OF

GENERAL SAMUEL CHAPMAN ARMSTRONG

FOUNDER AND PRINCIPAL OF HAMPTON INSTITUTE

BORN IN HAWAII IN 1839

AND TO

COLONEL WILLIAM N. ARMSTRONG

MINISTER OF THE INTERIOR, 1881-1882
AND PRESIDENT OF THE HAWAIIAN BOARD OF HEALTH
1882-1883

BORN IN HAWAII IN 1835

IN APPRECIATION OF THEIR FRIENDSHIP AND GENEROUS
ASSISTANCE IN THE FURTHERANCE OF MY
EARLY ANTHROPOLOGICAL AND STATISTICAL RESEARCH

LIST OF SCIENTIFIC PUBLICATIONS

OF

THE PRUDENTIAL INSURANCE COMPANY OF AMERICA

AVAILABLE ON REQUEST

By John F. Dryden:

(*1*) The American Type of Isthmian Canal; 1906.
(*2*) Addresses and Papers on Life Insurance and other Subjects; 1909.
(*3*) Uniform Laws and Legislation on Life Insurance; 1910.
(*4*) Industrial Insurance, Past and Present; 1912.

By Frederick L. Hoffman:

(*5*) History of The Prudential Insurance Company of America, 1900.
(*6*) Rural Health and Welfare; 1912.
(*7*) Exhibits of The Prudential Insurance Company of America, International Congress of Hygiene and Demography, Washington, D. C.; 1912.
(*8*) The Significance of a Declining Death Rate; 1914.
(*9*) The Chances of Death and the Ministry of Health; 1914.
(*10*) Practical Statistics of Public Health Nursing and Community Sickness Experience; 1914.
(*11*) Mortality of the Western Hemisphere; 1915.
(*12*) American Public Health Problems; 1915.
(*13*) The Documentary History of Insurance; 1915.
(*14*) The Mortality from Cancer throughout the World; 1916.
15) The Sanitary Progress and Vital Statistics of Hawaii; 1916.

By Frederick S. Crum:

(*16*) A Statistical Study of Measles; 1913.
(*17*) A Statistical Study of Whooping Cough; 1914.
(*18*) Anthropometric Table; Children Aged Six to Forty-eight Months; 1916.

CHARTS

I Mortality from Cancer (21 charts).
II Mortality from Tuberculosis (21 charts).
III Mortality from Measles (5 charts).
IV Mortality from Whooping Cough (4 charts).
V Mortality from Accidents (2 charts).
VI Mortality from Typhoid Fever (1 chart).
VII Mortality from Acute Anterior Poliomyelitis—Infantile Paralysis (1 chart).

THE SANITARY PROGRESS AND VITAL STATISTICS OF HAWAII

PART I
SANITARY PROGRESS

PART II
VITAL STATISTICS

PART III
STATISTICAL APPENDIX

NOTE.—For the fundamental statistics of this diagram, see page 79.

PART I

THE SANITARY PROGRESS OF HAWAII

The health progress of Hawaii is of exceptional scientific interest as perhaps the most conspicuous modern illustration of successful tropical adaptation and race progress. Because of its island situation, the climatological conditions are materially different from those of other localities of corresponding latitude. The average annual temperature of Honolulu is 74.6°, which compares with 80.3° for Georgetown, British Guiana, and 55.3° for San Francisco, Cal. The winter temperature of Honolulu averages 71.0°, or about the same as that of Havana, Cuba (71.8°). The average spring temperature is 75.0°, or about the same as that of New Orleans, La. (75.2°). The summer temperature is 78.1°, or about the same as that of Hamilton, Bermuda (78.9°). And, finally, the average fall temperature is 74.3°, or nearly the same as that of Havana, Cuba (74.9°). The temperature conditions are, therefore, not strictly tropical, but rather semi-tropical, and these conditions are further modified by prevailing air currents of considerable physiological and therapeutic importance.

The table following gives the seasonal mean temperature (Fahrenheit) of Honolulu compared with four other cities:

SEASONAL MEAN TEMPERATURE

	January to March (Degrees)	April to June (Degrees)	July to September (Degrees)	October to December (Degrees)	Annual (Degrees)
Honolulu	71.0	75.0	78.1	74.3	74.6
San Francisco	51.4	56.0	58.2	55.6	55.3
New Orleans	61.3	75.2	81.5	63.0	70.3
Hamilton (Bermuda)	62.5	69.6	78.9	68.4	69.9
Havana	71.8	78.8	81.8	74.9	76.8

For this and many other reasons Hawaii has justly been called the "Paradise of the Pacific." The accounts of the early explorers and missionaries leave no reasonable doubt that even under the most primitive conditions, life in the Hawaiian Islands must have been as nearly ideal as perhaps anywhere in the world. Discovered by Cook in 1778, the first missionary settlements were made in 1820, at which time the native population was estimated at 150,000. Reclus

estimates the indigenous population at the time of Cook's discovery at 300,000, which, judging from Ellis's "Tour Through Hawaii," published in 1828, and the accounts of native settlements, industries and arts in the United States Exploring Expedition of 1838-42, published in 1845, may not be far from the truth. In 1910 the total population of the islands was 191,909, and of this number 26,041 were pure Hawaiians and 12,506 were part Hawaiians of Caucasian or Asiatic intermixture. At the present time Hawaii represents probably a more composite population than any other territory of corresponding size in the world. The following table briefly sets forth the salient facts of the population as enumerated in 1910, with comparative data for 1890 and for 1900:

POPULATION STATISTICS OF HAWAII, 1890-1910

	1910	1900	1890
Hawaiian	26,041	29,799	34,436
Part Hawaiian	12,506	7,857	6,186
Caucasian Hawaiian	8,772	..	..
Asiatic Hawaiian	3,734	..	..
Caucasian	44,048	28,819	18,939
Portuguese	22,301	..	..
Porto Rican	4,890	..	..
Spanish	1,990	..	..
Other Caucasian	14,867	..	..
Chinese	21,674	25,767	29,362*
Japanese	79,675	61,111	..
Korean	4,533	..	..
Filipino	2,361	..	..
Negro	695	233	..
All other	376	415	1,067
Total	191,909	154,001	89,990

The mortality rate of any given locality or section is primarily conditioned by the age and race constitution of the people. The general death rate can not be relied upon as an entirely conclusive index of local sanitary conditions unless the data are standardized in conformity to accepted principles of statistical practice. Such standardization, however, is often difficult and occasionally impracticable.

*Includes 15,301 foreign-born Chinese, 12 360 foreign-born Japanese and 1,701 Hawaiian-born Chinese and Japanese not returned separately.

The very complex character of the population of Hawaii, therefore, requires as a first consideration a calculation of specific death rates for the principal racial elements, with due regard, as far as practicable, to age and sex. As is well known, the mortality rate of males is generally in excess of the mortality rate of females, at least in civilized countries. The mortality rate of primitive races is almost invariably excessive, but frequently the heavy loss of life is more than balanced by a high birth rate. On the mainland of the United States the negro death rate remains considerably in excess of the white death rate, regardless of far-reaching sanitary improvements of more or less similar effect upon both populations. As a general principle of mortality it may be said that native races in civilized countries suffer excessively from tuberculosis and venereal diseases, while non-native races in the tropics suffer excessively from malaria and digestive disorders.

Davidson, in his "Geographical Pathology" (1892), referring to the Hawaiian Islands, observes that the group is free from intermittent fevers, but that remittent fevers have been noted in Kauai and Waimea, with remissions almost identical with those of typhoid fever. The islands are considered by him as practically free from malaria, but his observations are quite general, and the evidence presented is entirely insufficient in matters of detail for the different islands and subsections of the same. *Syphilis*, according to this author, was unknown in the islands before the visit of Cook in 1778, but in 1839, when the geographical pathology of Hawaii was described by Chapin, "the disease was excessively prevalent and malignant." *Leprosy* is mentioned as having been unknown until about the year 1840, when it was believed to have been introduced by Chinese immigrants. In 1890 the number of lepers segregated at Molokai was 1,213, but this number was by no means considered as representative of the full extent of the evil.

Hirsch, in his "Geographical and Historical Pathology" (1883), mentions *dengue* as of rather common occurrence, being locally known by the name of "bonon" and occurring especially during the rainy season. According to the same authority, *smallpox* was first introduced into the Hawaiian Islands in 1853, from San Francisco, and "in eight months the disease carried off eight per cent. of the population, and continued its ravages in the year following, so that the number of inhabitants was much reduced." There was another severe epidemic of the disease in 1872. *Measles*, according to Hirsch, were introduced into the Hawaiian Islands in 1848. Hirsch also gives expression to the opinion that the islands were relatively exempt from *malaria*, but he goes too

far in claiming for these and other islands of the Pacific an absolute immunity from the disease. The view was probably based upon an imperfect understanding of the topography, or, in any event, the conclusions were arrived at before the extensive introduction of rice and taro planting in low-lying, overflowed areas, best shown upon the maps appended to the annual report of the Governor for 1906. The introduction of *tuberculosis*, and its rapid spread among the native races of the Southern Pacific, according to numerous authorities, dates from the time of the settlement by the Europeans, when the natives were induced "to make considerable changes in their mode of life."

Previously to contact with Europeans, according to the "Narrative of the United States Exploring Expedition," 1838-42, "the practice of medicine was not known in Hawaii in ancient times. They had then no physicians, and the only medical treatment, if such it may be called, was, when they had eaten too heartily of food, to drink seawater in large quantities, to produce a cathartic effect." They also appear to have practiced massaging to a considerable extent, consisting of the kneading of the flesh with their hands in cases of fatigue, overeating and pains. This practice continued for many years. By this time the decrease in the native population was becoming quite noticeable, and in the narrative referred to mention is made of the fact that the *venereal infection* "brought to these islands by the first voyagers may now be said to pervade the whole population and has reduced the natives to a morbid, sickly state; many of the women are incapable of child-bearing, and of the children who are born only a few live to come to maturity." The earlier writers frequently make mention of the injurious results of overeating, and the common occurrence of *diarrhea, dysentery, inflammation of the viscera,* and *cutaneous eruptions*. With reference to the population of a district on the island of Kauai, it is observed that "immoderate eating and fasting, living in damp huts, long exposure in the water, and sleeping on the ground, are all assigned as causes for the many sick and weak among the natives."

All authorities are agreed that at the time of the first visit of the Europeans, and for many years thereafter, the native Hawaiians were physically of a distinctly superior type. Featherman, in his work on Oceano-Melanesians, points out that "the physical constitution of the ancient Hawaiians, especially of the superior classes, had reached a high degree of development. They were generally above medium stature, and some of the chiefs were over six feet high, remarkably stout and sometimes even corpulent. They were generally well formed, had fine, muscular limbs and small feet, and they were not

only swift of foot, but their gait was quite graceful. Their complexion was of a reddish or dark brown, which, among the common people, graduated into a yellowish tint. Many of the lower classes were below medium stature, they had large feet and frequently they were even bow-legged. Their hair was black or dark brown, strong and straight or slightly curled; and though their beard was scanty, yet they generally let it grow long and never pulled it out. Their countenance was open, and their features were often almost regular, and they were always moderately agreeable. They had an oval face, a more or less expanded forehead, small, black, lively, expressive eyes, full nostrils, a slightly flattish nose, a large mouth, prominent lips and usually fine, well-ranged teeth. Their chest was broad and their abdomen but little prominent. The women of the higher classes had a gentler expression and had more agreeable features than the men. Their sparkling eyes and beautiful teeth, combined with sweetness and sensibility of expression, rendered them somewhat attractive. They had a firm, prominent bosom; small hands and feet; a clear brown and sometimes soft skin; but they were often disfigured by premature obesity, which detracted much from their natural charms. Some of the lower class women were equally as tall and robust but not as good-looking as the men, and at a distance the difference of sex could not be easily distinguished." The same authority states that "the lower classes were very uncleanly and untidy; but the people of aristocratic pretensions bathed several times a day. . . . They were plentifully supplied with healthy, nutritious food. The common people, besides fish, shell-fish and locusts, were principally restricted to a vegetable diet made up of yams, sweet potatoes, taro, bread-fruit, cocoanuts, plantains, sugar-cane, a species of fern and other roots. The higher classes added to these the flesh of hogs and dogs." The national dish for all classes was *poi*, derived from the taro roots and therefore entirely a vegetable compound.

These general observations are merely included as a suggestion for the more extended study of the preëxisting population and sanitary conditions, in explanation of the rapid decrease in the pure native population, a decrease not only relative, in consequence of a common admixture with other types of mankind, but actual, in the now surviving numbers of those of pure stock. Unfortunately, most of the earlier estimates regarding the native population of Hawaii are of doubtful accuracy. Certainly, as recently as 1872, an official census disclosed the fact that there were then 49,044 full-blood Hawaiians, and only 2,487 mixed-bloods of part Hawaiian ancestry, a total of 51,531, which compares with 58,765 according to a census return of 1866. At the

present time (that is, according to the census of 1910) the number of full-bloods has been reduced to 26,041, but the number of mixed-bloods, of either Caucasian or Asiatic intermixture, has increased to 12,506, giving a total native population of 38,547. In the meantime the foreign-born population has increased enormously, for whereas in 1872 the aggregate population of Hawaii was only 56,897, it was 191,909 in 1910. General death rates for the earlier years are therefore of relatively small value for comparative purposes, in view of the profound alterations in the racial constitution of the total population of the Territory of Hawaii.

A large amount of exceedingly valuable and interesting information has been published concerning the sanitary administration of the islands, conveniently summarized in the report of the Sanitary Commission appointed by Governor W. F. Frear, and published in 1912. In the preparation of this address, unfortunately, the official reports of the Board of Health previously to 1876 have not been available. The early mortality records are limited to the city of Honolulu, and according to the report of the Sanitary Commission the average general death rate for the years 1876-85 was 38.4 per 1,000, which during the ten years following was reduced to 25.5, and during the eleven years 1900-10 to 21.6 per 1,000. The total number of deaths recorded in Honolulu between 1876 and 1910 was 26,432, of which, however, no complete analysis by age, sex, race and cause has been made. In the opinion of the Commission the health progress of the islands "has always been exceedingly slow," and "for many years the advance in health matters was led by intelligent volunteers and therefore no other public service has accomplished so much without pay. . . . In Hawaii as elsewhere in the world the value of public health work is only just beginning to be appreciated and understood." This statement, however, hardly does justice to actual achievements, both under the monarchical and the American administrations. As early as 1855 a systematic water supply was installed in Honolulu, and in 1880 the first deep wells were bored, of which there are now one hundred and seventeen in the district of Honolulu alone. Unfortunately, the level of the water in the artesian basin has dropped twelve feet in twenty years, which, however, is in general conformity with artesian experience on the mainland of the United States. Considering the semi-tropical conditions of life and the small European population as well as the relative poverty of the islands, it is only natural that there should have been considerable reluctance during the earlier years to install expensive and costly sewerage systems, however urgently required for the needs of a growing population. But

the cholera epidemic of 1895 brought the subject forcibly to public attention and an adequate sewerage and water-works system was commenced in 1899 and materially increased in 1904. Even by 1912, however, there were still in use some 2,263 cesspools and 2,403 privy vaults. Many a large European city and many a city on the mainland is, in this respect, not much better safeguarded at the present time. As early as 1876 an act was passed to provide for the draining of the land, but it was not until 1882 that the agitation was commenced for the removal of standing water on low-lying ground. Contrary to superficial topographic descriptions, there are rather extensive areas of swamp-land, of which large portions are suitable for wet agriculture, which in itself is more or less detrimental to health, however indispensable to the economic needs of the people. The point was raised in the report of the Sanitary Commission for 1912 whether "the increasing knowledge of the immense loss due to mosquitoes" was not "putting wet agriculture to a severe test." "We are beginning to inquire," it is said, "if against the value of crops should not be set the loss due to mosquitoes and the easy spread of infection." For, it is pointed out, "another serious defect in the method of wet agriculture within the city is that dwellings are allowed to be used which are surrounded with standing water and without facilities for sewage disposal, thus enhancing the danger of water infection and the possibility of typhoid or cholera." Garbage and refuse disposal first received serious attention in 1878; and this, in 1882, was followed by the first attempt to control the sale of milk and otherwise provide for the regulation of the food supply. Housing conditions received public consideration for the first time in 1882, but the first regular sanitary inspection service was not introduced until 1890. A mosquito eradication campaign was provided for as early as 1904.

It is something very considerably to the credit of the former monarchy that as early as 1850 a board of health should have been established, which has been in constant service to the present time. But fourteen years earlier, under date of August 1, 1836, a notice was promulgated forbidding the pilot of Honolulu to board vessels until he had ascertained the health of the passengers and crew. Under date of May 29, 1839, the King, by proclamation, provided for a board of health of three persons for each harbor, whose duty it was to enforce quarantine regulations against smallpox, then quite prevalent on ships in the Pacific. The right to quarantine vessels and passengers was established by a constitutional provision adopted in 1840.

The internal regulation regarding health matters, however, did not commence until 1850, when the King empowered Messrs. T. C. B.

Rooke, George A. Lathrop, M. D., B. F. Hardy, G. W. Hunter, E. Hoffman, M. D., R. H. Smith and W. Newcomb to act as a board of health, and requested them to prepare suggestions as to laws and regulations, which accordingly were submitted to the King in privy council on December 16, 1850, and approved and enacted into law May, 1851. The act prohibited burials within the city, required reports of householders regarding malignant diseases within twenty-four hours, and the Board of Health was instructed to publish reports in times of pestilence each week. In 1853, Richard Armstrong, Minister of Public Instruction, refers to a recommendation for a hospital and a dispensary, and the urgency of a revision of the quarantine laws. The first health report was made in 1853, signed by H. R. H. Liholiho and Messrs. Rooke and Parke, but apparently the report exists only in manuscript in the Territorial archives. The first printed report appeared in 1854. In 1855 an act was passed providing for the establishment of hospitals for the care of indigent sick persons and for instruction in nursing. By 1856 as much as $2,733.65 had been expended for vaccination, and $141.65 for coroners' services. The Queen's Hospital was established in 1859, and in the same year a head-tax of two dollars on all foreign passengers was adopted, in conformity to American custom, to provide for the hospital treatment of sick and disabled Hawaiian seamen. In 1860 the first act to mitigate the evils of prostitution was passed, and an appropriation of $4,000 was made for its enforcement.

These early illustrations of sanitary efforts in Hawaii are of scientific as well as historical interest. In fact, it may be questioned whether a complete sanitary history of any community would be much more instructive and practically useful than a full account of the sanitary administration of Hawaii during the last sixty years. Not all the progress is limited to modern and American countries, and not all the credit for genuine progress belongs to so-called civilized communities. Even under the Hawaiian monarchy, with all its mistakes and shortcomings, many improvements, largely, of course, under the influence of the missionaries and other foreign residents, were made in sanitary matters which are even to-day notoriously neglected in otherwise progressive and representative communities on the mainland. As early as 1862 an insane asylum was established in Hawaii and an appropriation of $7,000 was made on this account. In the same year the first sanitary commission was created, including Prince Lot Kamehameha and Dr. Wm. Hillebrand, of Honolulu, Dr. F. W. Hutchinson, of Lahaina, Dr. J. W. Smith, of Kauai, and Judge Wight, of Kohala. In 1864 the Board passed the first official regulations for

the burial of the dead; and on January 23, 1865, an act was passed to prevent the spread of leprosy. The passage of this act so profoundly affected all future health matters that the subject of leprosy will receive subsequent consideration at length. It is sufficient for the present purpose to state that, according to the first regular separately printed report of the Board of Health, for 1866, out of a total appropriation of $23,461.05 for two years, $16,012.84, or 68 per cent., was on account of this disease.

In 1868 the Board of Health was exclusively Hawaiian, and made purposely so in order to control the *kahunas*. In the same year a law was passed controlling the sale of poisons. The kahunas of the Hawaiians correspond to the medicine-men among the American Indians. In former times they had tremendous influence, chiefly among the lower and the middle classes. Most of their practice was based upon gross superstition and adroit dissimulation. There are possibly a few of these surviving to the present day. By 1876 the total expenditures on account of health, chiefly leprosy, quarantine against measles, free medicines for the poor, the care of the insane, etc., had reached $55,000, or about ten per cent. of the entire government revenue. In 1876 the vital statistics of the Honolulu district were commenced, and they have been improved and continued to the present day.

In 1882 a health report was made by W. N. Armstrong, President of the Board, who subsequently, as Minister of the Interior, became strongly influential in directing foreign immigration to the islands.* Passing over minor details of sanitary administration, reference may be made to the fact that by 1890 the annual expenditures on account of health had increased to about $180,000. Of the appropriation for the two years ending March 31, 1890, amounting to $367,223.81, the sum of $239,342.40 was on account of the Molokai leper settlement. In 1892 the enforcement of an earlier act to mitigate the evils of prostitution was turned over to the Board of Health by the Department of the Interior; and in order to suppress the cholera epidemic of that year the Minister of Finance, on request of the Board of Health, was given power to close all ports except Honolulu.

On January 17 of the following year (1893), the monarchy came to an end by the establishment of a provisional government, which appropriated $360,452.40 for health purposes, out of a total revenue of $2,097,246.67, for the two years ending March 31, 1896, equivalent to nearly seventeen per cent. On July 3, 1894, the Republic of Hawaii

*In 1882 Dr. W. M. Gibson published a second edition of "Sanitary Instructions for Hawaii in the English and Hawaiian Languages."

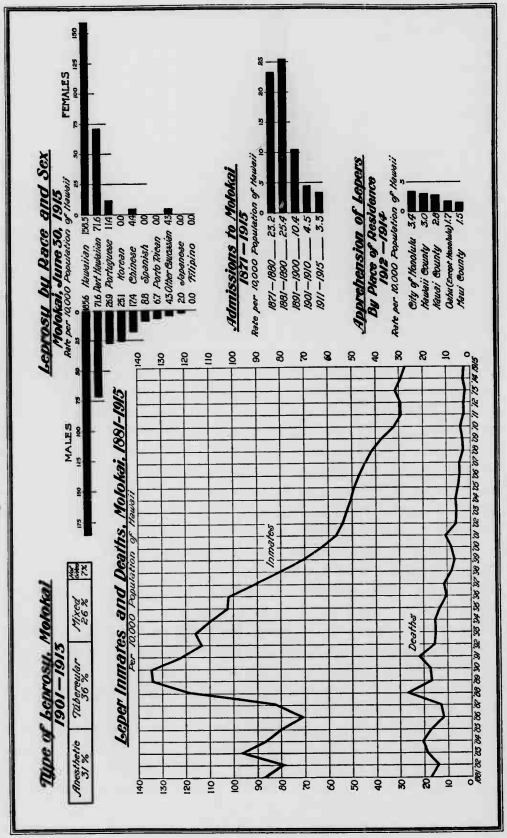
was proclaimed, and the President was given power, with the approval of the Cabinet, to appoint a board of health. On June 14, 1900, Hawaii was constituted as a territory of the United States, and Judge H. E. Cooper became the first president of the Board of Health of the Territory of Hawaii. During the years following much legislation was passed regarding the control of the manufacture of poi, on sanitary grounds, which has continued to the present time. In 1911 the legislature passed the first law intended to check the spread of tuberculosis, in proper recognition of a truly alarming situation.

During the long period of years under review numerous important changes have occurred in the frequency of special diseases—some have increased and others have diminished. Reference has been made to smallpox epidemics, which, during the fifties, caused a large mortality and a relatively considerable expense for vaccination and other purposes. In 1853, according to the report of the Sanitary Commission, out of a population of 19,126 on the island of Oahu alone, 9,082 were afflicted with the disease, and of this number of cases, 5,748, or 63.3 per cent., died. The mortality rate of the islands reached the extreme proportion of 109.7 per 1,000.

In 1870 there was a serious epidemic of fever, the true nature of which appears not to have been determined. The so-called "*Hawaiian fever*," as described by Goodhue during more recent years, has not, even on the basis of morphologic findings, been conclusively established. He observes, however, that "the clinical differences are not so marked that they cannot be included under some form of typhoid fever." The disease may possibly conform more closely to the so-called "slow fever" of southern Georgia. The mortality rate from all causes for 1869 was 58.9 per 1,000 of population, increasing to 64.8 during the following year. In 1880 *typhoid fever* was so prevalent that the Board of Health summoned all the physicians from the different islands to a conference. *Measles* were also excessively prevalent, having first caused a serious epidemic in 1860. *Smallpox* had become epidemic in 1881, there having been 780 cases, with 282 deaths, or a fatality rate of 36.2 per cent. The net cost of this epidemic was $98,698.36. During August and September of 1895 Hawaii had its first experience with *cholera*, there having been 87 cases, with 64 deaths, or a fatality rate of 73.6 per cent. The disease, according to the Sanitary Commission, was undoubtedly introduced into the islands on the steamship "Belgic," which arrived on August 9th. The direct cost of this epidemic was $61,697.55. A volunteer citizens' committee aided the health authorities by establishing complete daily inspection, and finally succeeded in controlling and checking the disease. Four years

later, on December 12, 1899, occurred the first case of *Asiatic plague*, which soon became epidemic, and during its course caused a financial loss of $625,000. There were, however, only 71 cases, but no complete report concerning the epidemic has been published In connection with the efforts for the control of the disease and the destruction of unsanitary quarters, a conflagration occurred which caused a loss of $1,315,000.

All of these illustrations emphasize the complex character of the sanitary problem in Hawaii. The official reports for a long period of years have been summarized in the report of the Sanitary Commission of 1912, from which most of the preceding observations have been derived. The financial statements establish the liberality of the former monarchy as well as of the present Territorial government in all important matters concerning public health. The very complex population to be dealt with, as best illustrated in the case of leprosy and during the outbreaks of cholera and plague, has naturally made an effective sanitary control quite difficult. As recently as 1879, fifty-eight per cent. of all the deaths of Hawaiians were entirely unattended during sickness by any qualified physician. It was estimated for this year by the agent of the Board of Health that one-fourth of those dying unattended might have been saved by proper medical attendance. The high mortality from fevers during these early years is suggestive of the possibility that malaria was more common than generally assumed. In the year ending March 31, 1879, out of 638 deaths from all causes, 153, or 24.0 per cent., were from fever, and during the year following, out of 745 deaths from all causes, the number of deaths from fever was 196, or 26.3 per cent. According to Davidson, a fever not specified in Hawaii may safely be assumed to be "mainly tropical typhoid." This conclusion, however, must be accepted with reserve. It is more likely that the diagnosis was, in many cases, made superficially, particularly in the case of the natives. Evidence, however, is not wanting that the prevailing fevers may have been true typhoid in the large majority of cases. In the report of the Board of Health for 1880 the statement occurs that "Honolulu has been severely visited by the typhoid fever, many of our foreign citizens having been taken"; but the high death rate was chiefly among Hawaiians, and due to the want of medical care. The direct cause of the high mortality at Honolulu, however, was unquestionably a polluted water supply. In the report of 1882, made by the Hon. W. N. Armstrong, Minister of the Interior, the question of an improved sewerage system was discussed at some length, and the view was advanced that it was very probable "that some of the



Note.—For the fundamental statistics of this diagram see page 80.

sickness is due to the quality of the drinking water." The extensive *smallpox* epidemic of this year, however, demanded prior consideration. Mr. Armstrong directed attention to the fact that while the vaccination of children was compulsory, that of adults was a matter of choice. It was therefore urged by him that effective laws be passed, inflicting heavy penalties upon those who did not present themselves for vaccination whenever notified to appear by the proper authorities; for, he remarks, "it must be evident that the most effective way to prevent the spread of the disease is by thorough vaccination, and not by attempting to keep it out of the ports of the kingdom."

These and many other illustrations from the sanitary history of Hawaii emphasize the enlightened spirit characteristic of the government of the islands during the later years of the monarchy, as well as under the provisional government, and the Territorial administration by the United States. As observed in the report of the Board of Health for 1884, in which attention is directed to the fact that Hawaii had been represented at the International Sanitary Convention of 1881, "the humane and enlightened attitude of Hawaii is respected throughout the civilized world, and her position calls for continued sacrifices and greater activities. We must take an active part in researches to examine into the sources of diseases which attack us, and to find means for their mitigation." With special reference to *leprosy*, it was urged upon the legislature that "the disease which commands so large a share of public attention and calls for so large an appropriation of the public revenue should be studied by competent authorities under Hawaiian auspices in various parts of Malaysia and Polynesia, where it is to be found; and let Hawaii continue to maintain her honorable and enlightened position in Oceanica by her advanced philanthropic enterprise." Leprosy was first brought to official attention in a report by Dr. Hillebrand, surgeon of the Queen's Hospital, in April, 1863. The disease was called by the natives, "Mai Pake," or "Chinese disease," and Dr. Hillebrand diagnosed it as genuine Oriental leprosy. The subject received incidental consideration during the next two years, and under an act passed by the legislature January 3, 1865, the Board of Health was authorized to acquire suitable land for an isolated settlement, and accordingly a receiving hospital was established at Kalihi, within the city limits of Honolulu, and at the same time the north side of Molokai island was acquired by purchase and exchange "for a large settlement of incurables." According to the best available information there were 275 cases

in the whole group of islands, but this was probably an underestimate. The true nature of the disease was recognized by Dr. Hillebrand, in whose opinion "the disease was undoubtedly contagious," but this property did not seem to him to be strongly developed. According to Dr. Hoffman, in charge of the Kalihi hospital, "the disease is contagious only on close and continued contact." In 1870 Dr. Hutchinson reported that "the disease is contagious and inherited." Under a law of July 19, 1870, the Board of Health was given power "to make and promulgate such rules and regulations as may be necessary for the government and control of lepers placed under their charge and these are to have the force and effect of statute law, provided always they are approved by the King, and are published." By 1872 it was found that previous reports regarding the reduction in the number of lepers had been erroneous. The natives were found to be quite indifferent to the disease, and many isolated cases were discovered secreted in remote valleys or other obscure hiding-places in the different islands.

As early as March, 1873, Dr. Trousseau, a French physician, had given expression to the opinion, as quoted in the report of the Sanitary Commission, "that the only method at all likely to be successful (in the control of leprosy) is immediate, energetic, and to a certain extent unsympathetic isolation of all who are suffering with the disease." During the same year the president of the Board of Health reported that "half-way measures will cause enormous expense and bring no result"; that "ignorance is great and exposure reckless." Isolation thereafter, however, was more or less relaxed, and numerous alleged cures for leprosy were tried, but without success. In 1879 Father Damien arrived at the settlement of Molokai, and he brought with him from China a large quantity of medicine known as "Hoang nan pills," as a cure for leprosy, which, however, also proved a failure. A number of excellent recommendations were made in 1882 regarding the settlement, by Wm. N. Armstrong, president of the Board of Health, with a scathing indictment of the past medical treatment of the lepers at the settlements. Admissions increased in 1883, but in 1884 a statement was issued by the president of the Board of Health, W. M. Gibson, maintaining that leprosy was not contagious. Dr. E. Arning, a German expert on leprosy, made investigations this year at Molokai; he was obliged to discontinue his work in 1885, but his report was printed in 1886.* Mr. Gibson, in the same year, recanted his former utterances and

*The observations by Dr. Arning were published in the Transactions of the Berlin Anthropological Society for 1887, under the title "Ethnography of Hawaii."

recognized the disease as contagious, proposing local segregation. An exceedingly interesting and elaborate report on leprosy was published this year by the Board of Health, on the basis of special reports made by Hawaiian consuls located in countries in which leprosy was endemic. In the report for 1888 Dr. N. B. Emerson, president of the Board of Health, observes that "leprosy was first clearly made out to exist in this country about the year 1840, in the person of . . . a messenger of one of the chiefs who died in 1852," the case having been reported by the Rev. D. D. Baldwin, M. D., of Lahaina, in a communication dated May 26, 1864. The number of suspected leprosy cases in 1888 was 644, and segregation was commenced in earnest, the new admissions to Molokai increasing the number of patients at the settlement to 1,033. Following annexation, the Territory continued the settlement in much the same manner, with constant improvements, until 1903, when, according to the report of the Sanitary Commission, Dr. C. B. Cooper, as president of the Board of Health, commenced to agitate for the scientific study of the disease by the Public Health Service of the Federal government. As a delegate to the American Medical Association at Atlantic City, N. J., that year, Dr. Cooper made an earnest plea for a Federal appropriation, and on March 3, 1905, Congress passed an act to provide for the investigation of the disease with special reference to the care and treatment of lepers in Hawaii, and accordingly an appropriation of $100,000 was made for a hospital, and $50,000 was provided for its maintenance. The necessary work in connection therewith was carried through by Dr. L. E. Pinkham, who became president of the Board of Health April 13, 1904, and who was appointed Governor of the Territory in 1913. The long legislative struggle with regard to the control of the disease and the absolute power over the person of lepers for the purpose of successful segregation does not fall within the scope of this discussion. The Sanitary Commission in 1912 estimated that to date approximately four million dollars had been spent by Hawaii in the control and treatment of the disease. They conclude their interesting and important investigation with the statement that "We believe that if the present plan of segregation fails to effect the desired end, it would be well worth while to consider carefully whether local segregation would not give better results than the present system. This would undoubtedly be more expensive than the plan in vogue at the present time, but it is possible that if segregation could be effected in a place where patients would not be so far removed from relatives and friends as at Molokai, the result might be a disposition on the part of lepers to present

themselves in the earlier stages of the disease and a willingness on the part of relatives to permit members of families to be isolated."

Granting the soundness of these views in the light of an extended experience on the mainland, where lepers have been segregated at settlements not too remote nor too exceptional regarding local surroundings, as, for illustration, at Carville, La., or at Penikese Island, Mass., or at the isolation hospital within the city limits of San Francisco, the policy of segregation at Molokai must be looked upon as the better part of wisdom. Speaking from personal knowledge on the basis of my own visit to this settlement, I am confident that the best possible policy for Hawaii has been pursued in the case of this most afflicted class of human beings. Unfortunately, exaggerated and not far from absurd accounts regarding Molokai have impressed upon the public a totally false view of local conditions concerning leprosy and the leper, which has done much harm to the cause of effective segregation and leprosy control. The best evidence is to be found in the increasing willingness of those afflicted with leprosy to go, first, to Kalihi for examination, and then to Molokai for permanent isolation, if the disease is incurable. The belief is gaining ground, and rightfully so, that the patient will be given every possible opportunity for a cure and effective and thoroughly scientific treatment by the medical officers in charge of the receiving station at Kalihi. Without such treatment there certainly is no hope, and however slight the lingering chance may be for a cure, there is an increasing number of cases on record where apparently such a cure, at least in anesthetic cases, has been obtained. Be this as it may, it is something considerably to the credit of the Territory of Hawaii that such adequate, humane and almost ideal provision should have been made for the lepers, who are almost invariably from the lowest and poorest class, and that during the fiscal year ending June 30, 1914, out of the total revenues of the islands the sum of $216,578.24, or 5.75 per cent., should have been appropriated for their care.*

As previously observed, a thorough study of Hawaiian sanitary history would make a most instructive and practically useful contribution to knowledge. The changes in point of view regarding the increased prevalence of certain diseases, or their nature and treatment, would make a valuable addition to the literature of medicine. In the report of the Board of Health for 1892, the statement occurs that the most fruitful source of disease at Wailuku, on the island of Maui, is *malaria*, which is constantly "hanging around the low and damp

*For an excellent and thoroughly trustworthy account of Molokai Settlement, see an article by Miss Katherine F. Gerould, in *Scribner's Magazine*, July, 1916.

lands in the town." The increasing number of Orientals at this time drew attention to the fact that with regard to diseases common to any particular race, "*enteric fever* was almost entirely confined to the Japanese," and the immunity of the Chinese and Portuguese is mentioned in cases of such as were living in close proximity and using the same water supply. In the same report the continued practice of the native kahunas is referred to as "a curse to the Hawaiian race, by maltreatment, and no treatment." With further reference to the *Japanese*, especially those living at North Hilo, Hawaii, it is pointed out that the Japanese laborers seem to lack sufficient stamina to withstand even the slightest ailment; often taking to their beds when a native Hawaiian or a Chinaman would in a similar matter not think it worthy of notice. The very fatal type of *typhoid fever* which prevailed this year (1891) may possibly have been plague, or even cholera. At about the same time *beriberi* was observed, among the Orientals, and *anchylostoma duodenale*, or *yellow disease*, which, however, was confined to the Portuguese. According to Dr. C. L. Stow, of Makawao, Maui, "beriberi is a disease that appears to be exclusively confined to the Japanese—at any rate, in these districts, for the Chinese appear to escape."

The prevailing diseases among the Hawaiians in 1892 were pulmonary *tuberculosis* and the various forms of chronic *kidney* and *liver* troubles, with their sequelae, chiefly attributed to the immoderate use of native and imported intoxicants. *Syphilis*, however, was reported as apparently on the increase among native Hawaiians, and also among the Portuguese, who had hitherto been remarkably free from it. The evils of this malady, it is observed, "are more especially noticeable among the rising generation, in whom the symptoms of inherited syphilis are lamentably apparent."

The *cholera* epidemic of 1895 requires at least brief consideration. A special report on the disease was fortunately published by the Board of Health, in marked contrast to the neglect to issue a corresponding official record of the epidemic of plague in 1899. Cholera prevailed in the city of Honolulu during the months of August and September, 1895, the first case having occurred on August 20, in a suburb of the city. The steps taken immediately for the purpose of preventing the disease are described in detail, and are in the main in conformity to modern sanitary practice. The use of fish was forbidden, on account of the possibly infected waters of the harbor, and the gatherings of large numbers of people were prohibited for the purpose of preventing contact infection. A relief association was organized and committees were appointed for the other islands. Serious difficulties

were met with in the refusal of a number of foreign steamship companies to carry the mails, a special hardship, in view of the fact that the islands at that time were without cable communication. The physicians of the Board of Health, realizing at the very outset the gravity of the situation, "early instituted culture experiments with the discharges obtained from the first cases of suspicious sickness which appeared in Honolulu," and the evidence furnished by these experiments was conclusive. The numerous regulations of the Board of Health and notices of precautions against cholera issued by the Board were in conformity to approved methods of the mainland. Much no doubt was done that would at the present time be considered unnecessary, but it was best to err on the side of conservatism. The difficulties to be met by the Board of Health were, unquestionably, enormously increased by the very complex population and the interisland character of the Territory. In the aggregate there were 87 cases, with 64 deaths, or a case fatality rate of 73.6 per cent. The cases are described in the special report with admirable attention to essential details. It is not going too far to say that but for the excellent manner in which the epidemic was managed, both by government officials and by private volunteer committees, the spread of the disease would have been more general and the mortality would have been decidedly greater. As a result of this experience, the sanitary condition of Honolulu was greatly improved. The general death rate of the city in 1894 was 22.4 per 1,000, but for the Hawaiians alone the rate was estimated at 31.2.

No extended analysis of the vital statistics of the islands, otherwise than for Honolulu, appears to have been made. The records are not in such condition as to permit of a convenient statistical study, since thus far the card system has not been adopted. The difficulties are unduly complicated by the large number of separate races which require consideration. A study of the mortality in the aggregate is of rather limited practical utility. From the report of the Sanitary Commission tables have been prepared, showing, first, the death rate for all the islands for the period 1851-75, second, the death rate of Honolulu for the period 1876-99, and, third, for the Territory since annexation, or the period 1900-10, with the data brought down to 1915 from official sources published since the report of the Sanitary Commission was issued. (All of these tables are given in the Appendix.) According to these tables the maximum death rate occurred in 1853 (109.7 per 1,000), attributed chiefly to smallpox. The next highest death rate on record occurred in 1870 (64.8), attributed chiefly to scarlet fever. During 1876 the death rate of Honolulu, based, however, on somewhat doubtful returns, was 68.2 per 1,000. During the

years immediately following the rates varied from 43.6 per 1,000 for 1877 to 39.3 for 1878, 42.0 for 1879, 37.4 for 1880, and 47.3 for 1881. During these last two years the chief causes of death were measles, typhoid fever and smallpox. Subsequently to 1881 the general death rate has never exceeded 30 per 1,000, except in 1883, when it was 34.4, in 1899, which was the year of the plague, when the rate rose to 31.2, and in 1900, when it rose to 32.8 per 1,000, due to the same cause. Since that time the rate has gradually declined, as shown by the table following:

MORTALITY OF HONOLULU, 1876-1915

	Total Population	Death from All Causes	Rate per 1,000 Population
1876–1885	169,645	6,516	38.4
1886–1895	241,564	6,152	25.5
1896–1905	388,933	9,378	24.1
1906–1910	223,519	4,386	19.6
1911	54,774	1,251	22.8
1912	57,367	1,057	18.4
1913	59,960	1,112	18.5
1914	62,600	1,330	21.3
1915	64,150	1,163	18.1

An epidemic of *bubonic plague* in Hawaii commenced with a case reported on December 12, 1899, in the city of Honolulu. A few additional cases were reported, but on December 19, by order of the Board of Health, the quarantine was raised, as the disease seemed to have ceased. Interisland steamers were allowed to depart for other ports in the islands, taking on board only approved freight, and passengers having a physician's certificate and a permit from the office of the Board of Health. No goods of Japanese or Chinese origin were allowed to leave the port until they had been thoroughly fumigated to the satisfaction of the agent of the Board of Health. No steerage passengers, however, were allowed to depart. A renewal of the outbreak occurred on December 24th and 25th, and at the close of the year the Territory found itself confronted with the most serious calamity in the history of the islands, and certainly since the outbreak of cholera in 1895. The absence of a complete report concerning this epidemic makes it impossible to properly review the situation, which in many respects must have been of exceptional scientific and humanitarian interest. Once more the work of local volunteer committees was successfully utilized in the effective control of the disease. Many acts of personal heroism, which should have been made a matter of permanent record, failed of this

deserved consideration. A descriptive statement of the fight against bubonic plague in Honolulu, by R. D. Silliman, appeared in the "American Monthly Review of Reviews" for May, 1900, including a graphic account of the great fire of January 20, which destroyed the larger portion of the slum district.

A brief account of the epidemic, however, is presented in the annual report of the United States Marine-Hospital Service for 1900, by Dr. D. A. Carmichael. A commissioned medical officer of the service detailed to Honolulu under date of August 4, 1898, rendered considerable assistance in preventing the infection of vessels bound to the United States. The late Dr. Walter Wyman, in a letter dated January 22, 1900, to the Secretary of the Treasury, makes the following statement in this connection: "The Hawaiian government, during the cholera epidemic of 1895, displayed great energy and intelligence, and was successful in promptly suppressing the epidemic, and I feel convinced that the measures which they propose now are necessary and reasonable. . . . While the bubonic plague is not considered to be a water-borne disease to the extent that cholera is, it nevertheless may be conveyed in drinking water, and there are various ways in which the water supply could become infected with the plague bacillus."

Now that it is known that bubonic plague is chiefly, if not exclusively, carried by rats, ground-squirrels, and possibly other animals, the theory of its being a water-borne disease is no longer held. In an extended report on the plague epidemic during June and July, 1901, published in the Sanitary Abstracts of the Marine-Hospital Service, the general situation is fully reviewed, with a discussion of individual cases, and a number of post-mortem reports by Dr. J. S. B. Pratt, then, as now, the executive officer of the Territorial Board of Health. As previously pointed out, the modern principles of prevention and control were not recognized at this time, and it is no reflection upon the Board of Health of a small island community that it should not have been in advance of older and much larger countries. As said by Dr. Rupert Blue, now the Surgeon-General of the United States Public Health Service, in an address on the conduct of a plague campaign, written in the light of his extended experience in eradicating plague in San Francisco, the first requirement is the precise location and determination of plague cases, both human and rodent, which, of course, entails "a careful examination of all dead bodies, the examination of all sick persons, and the isolation and observation of all suspicious cases and contacts." As still more concisely set forth by Dr. Isadore Dyer, in an outline of facts

prepared for the Medical Plague Conference Committee of New Orleans, "bubonic plague is a rat and a rat flea disease; no rats—no plague."

In the annual report of the Governor for the fiscal year ending June 30, 1911, it is pointed out that "no subject has received more careful attention during the last biennial period than that of public health. A beginning was made a little more than two years ago, when a new policy was inaugurated in the handling of leprosy, which has long been the largest single subject under the department of public health. Since then a vast amount of work has been done toward perfecting and developing the many other branches of work under this department. The result has been a great expansion in the work and a marked increase in its efficiency. In this effort the representatives of the United States Public Health and Marine-Hospital Service in the Territory have assisted much through their hearty coöperation. Not the least difficult as well as successful task has been the development of public sentiment to a fairly adequate realization of the situation, and the securing of coöperation on the part of local governments, business concerns, and individuals. . . . The local conditions—including an extremely cosmopolitan population, a subtropical climate, and extensive areas of low or wet land in the largest centers of population—changes in the sources of immigration, and the location of the Territory at the crossways of commerce between the Orient and Mexican and Central and South American countries make the subject of public health one of imperative moment, not only as a duty of self-preservation locally, but also as a duty toward continental United States, of which this is a health as well as a military and naval outpost, and toward the large and increasing military and naval forces of the United States stationed in and near the city of Honolulu."

The earlier references to extensive fever frequency, possibly other than typhoid, suggest that *malaria* has been more common than has generally been assumed to be the case. E. S. Goodhue, M. D., in a scientific study of the mosquitoes of Hawaii, has pointed out that the local mosquitoes are represented by two genera and two species, namely: "(a) *Culex pipiens* (Van Dine). Common gnat of Europe. Thorax covered, narrow curved, gold brown scales; abdomen basal pale bands.—(Braun.) (b) *Stegomyia fasciata*, or calopus (Henshaw). Easily told by head and scutellum being entirely clothed with fat scales. —(Braun.) (c) *Stegomyia scutellaris* (Van Dine). Thorax one median silvery stripe so differentiated from fasciata.—(Ibid.) (d) *Culex pungens*, or *fatigans* (Goodhue). Common tropical gnat—resembles *pipiens*, differs in stem of first submarginal cell always being much

longer.—(Braun.)" All of these are probably pathogenic, and Goodhue has described the varieties with illustrations. But with regard to the *stegomyia fasciata*, he observes that this insect penetrated into the Hawaiian Islands only a few years ago, and that now in some places it is quite abundant.* The evidence seems somewhat doubtful as regards *yellow fever* in Hawaii, and according to Goodhue no case has ever occurred, probably because of the difficulty in introducing a yellow fever patient in a stage of the disease at which the mosquito can become infected. His local investigations suggest that the *stegomyia scutellaris* has some connection with the periodical epidemics of *influenza* in the islands, which, however, is open to serious doubt. Some years ago press dispatches, according to a reference in a medical journal, announced the first case of yellow fever ever reported or known to have been present in Honolulu, aboard a Japanese cruiser which had arrived in port from Manzanillo, Mexico.

In 1905 a rather peculiar sickness occurred on the island of Molokai outside of the leper settlement, practically confined to the Pelekunu valley. A relief expedition was sent out by the Territorial Government, and eight deaths were subsequently reported as having occurred. The sickness might perhaps have been typhoid, but in a report made to Governor Carter it was suggested that possibly the disease was due to poisoning.

The so-called *Hawaiian fever* was discussed at some length in the June 10, 1905, issue of the "Medical News," in a letter from Honolulu, according to which the term was first used in a death certificate issued by a Japanese physician practicing in Honolulu. The subject was further discussed before the Hawaiian Medical Society, by Dr. A. N. Sinclair, in an address on "Fevers in Hawaii and their Relation to Malaria." In his opinion the temperature in Hawaiian fever is of the remittent type, but in its mildness the disease resembles the tertian type. The temperature, however, rises suddenly to 103° F. or higher, the rise being preceded usually by a very short rigor, which generally takes place in the early evening. This, it is pointed out, "is an extremely rare occurrence in malaria," a disease not often met with in the Hawaiian Islands. Hawaiian fever is not amenable to quinine and there are grounds for believing that the drug is here actually harmful. According to Dr. Cooper, in a large number of cases of this local fever treated at the Queen's Hospital, Honolulu, quinine has been without effect. Mention was made in this

*For an extended report on the Mosquito in Hawaii by D. L. Van Dine, Entomologist, Hawaiian Agricultural Experimental Station, see Bulletin No. 6, publications of the Hawaiian Agricultural Experimental Station, Honolulu, 1904.

connection by Dr. Herbert of the probability of some miasmatic toxic action in Hawaiian fever, and of the occurrence of a moisture-laden cloud over Honolulu, especially in the lower portion of the city in the morning, seriously affecting the people living within the influence of this cloud to the extent of actual sickness, listlessness, loss of appetite and high fever. "Relief from these symptoms was at once obtained by removal to a higher altitude or by a few days at sea." "No plasmodium was to be found in the blood of these patients, but the disease, it was held, resulted without question from paludal miasma."

These interesting though inconclusive observations confirm the view of E. S. Goodhue, M. D., of Holualoa, on the island of Hawaii, suggesting Hawaii as a field for scientific work in tropical medicine. In a discussion in the "Journal of the American Medical Association" for May 26, 1906, he reviews the occurrence of anchylostoma duodenale, bubonic plague, filariasis, cholera, beriberi, and other diseases, concluding with a reference to a case of tropical ringworm and an epidemic of gangrenous rectitis. Even earlier than this, under date of November 5, 1898, in the "Medical Record," Dr. Henry M. Lyman, of Chicago, had given expression to the view that the United States might well be induced to make a thorough investigation of the diseases that exist in salubrious Hawaii, for no more suitable biological station for such research could, in his opinion, be found in any part of the world. Perhaps the most interesting special medical problem demanding consideration is the question of whether malaria, in its true form, is really met with in Hawaii or not.

A *mosquito census* was published for the fiscal year ending June 30, 1914, giving for all districts, on the basis of 570 specimens, 67.8 per cent. of culex fatigans, 3.4 per cent. stegomyia calopus, and 28.8 per cent. stegomyia scutellaris. As observed in this connection in the report of the Sanitary Inspector of Oahu, to which the census was limited, the weak point in the mosquito census is that, after all, the general figures do not apply to any particular subsection, even though the census be taken of sanitary districts, and while the city, as a whole, may have but three per cent. calopus, some particular district, notably the water-front, may have from twenty to thirty per cent., and therefore be far from being yellow-fever proof. Whether the anopheles are present or not, the efforts which are being made throughout the islands to reduce the mosquito nuisance to a minimum are apparently productive of good results.

Hawaii, at the crossways of the Pacific, is exceptionally exposed to the introduction of *tropical diseases* from the Orient, more so on

account of the fact that a large portion of its population consists of Orientals. According to the census of 1910, 41.5 per cent. of the population had been born in Japan, 11.3 per cent. in China, and 2.4 per cent. in Korea. Since then the immigration of Filipinos has been quite considerable. Yet, as a matter of fact, the islands are relatively free from tropical and semi-tropical diseases, with the exception of leprosy and beriberi, which, however, also occur in more northern latitudes. The death rate for the Territory in 1914 was only 16.7 per 1,000 of population, having been highest for the native Hawaiians, or 39.4, and lowest for the combined group of Americans, British, Germans and Russians, or 8.3 per 1,000. The leading cause of death for the year was *pneumonia*, which accounted for a rate of 18.7 per 1,000 of population, followed by tuberculosis, with a rate of 18.5, and gastro-enteritis, with 12.0. Of the total mortality, 41.5 per cent. were deaths at ages under five, due chiefly to pneumonia and gastro-enteritis.

The *birth rate* of the Territory for the year 1914 was 29.7 per 1,000 of population, so that there is a considerable excess of births over deaths regardless of the high mortality among the natives. For the pure Hawaiians the birth rate was only 19.8 per 1,000, but for the part Hawaiians it was 49.7. The corresponding death rate for these two elements, as officially given in the report for 1914, was 39.4 for the pure Hawaiians and 14.2 for the part Hawaiians.

Pneumonia has not thus far received the required scientific and sanitary consideration. The excessive frequency of this disease in Hawaii is not explained by climatic conditions. Davidson, in his Geographical Pathology (1892), has pointed out that pneumonia and bronchitis were of frequent occurrence, but that they did not appear to be more than moderately fatal. *Tuberculosis*, however, was causing in Honolulu an average death rate of 24 per 10,000 of population. Tuberculosis, for some years past, has received the required special attention, with some assurance that the efforts made for the gradual eradication of the disease will bear fruit in due course of time, for, with a large native and Oriental population, the tuberculosis problem in Hawaii is much more complex than on the mainland. There is probably no more instructive experience in this respect than the admirable work done at the Leahi Home. The data which have been published with regard to this institution do not, however, permit of a convenient and conclusive summary. According to the report for 1914 the number of cases treated was 171, with a fatality rate of 32.1 per cent., a proportion of apparent cures of 8.5 per cent. and of arrested cases of 22.5 per cent. Since most of the patients are natives, these results can not be considered disappointing. The institution

reflects the philanthropy and governmental solicitude of Hawaii. It is a model sanatorium, in broad outlines conforming to the best corresponding institutions on the mainland. As is usual with such undertakings, ideal results are not obtainable for want of funds, but with the available means the best possible is being done for an unfortunate element of the community. The average cost per patient per month in 1914 was $48.86. The tuberculin treatment is in use, and there is increased belief in its efficacy. It is claimed that before the adoption of the tuberculin method only 27.2 per cent. of the patients were cured to the extent of being able to return to their former employment, but that since the adoption of this method the proportion either cured or enabled to return to work has increased to 47.6 per cent. How far these conclusions are justified is a question for experts to decide. The Leahi Home represents a total investment of $295,561, which, in view of the relatively small population of the island of Oahu and the limited wealth of its people, must be considered indeed a remarkable illustration of generous philanthropy. Of the one hundred and thirty-four patients admitted during 1914, thirty-one were Hawaiians or part Hawaiians, twenty-one were Filipinos, seventeen were Chinese, ten were Portuguese, twelve were Koreans and ten were Japanese. The institution, therefore, ministers to all the above elements of the population.

The tuberculosis situation is reviewed in a special report of the Anti-tuberculosis Bureau for the year 1914. The problem is so involved that it must be questioned whether the apparent results are in exact conformity to the facts. Certainly as far as the official statistics warrant a precise judgment, the death rate continues unduly high, but reviewing the three years 1911-13, the death rate has declined from 19.4 per 10,000 of population to 16.0, and the actual number of deaths has been reduced from 382 to 341, regardless of an increase in the population

Infinitely more important than treatment and cure are measures and means aiming directly at *the prevention of disease.* The sanitary requirement with reference to the housing and care of plantation laborers in force throughout the Territory must be considered a model to the entire civilized world. It may be questioned whether anywhere more adequate rules and regulations are rigorously enforced with impartiality for the protection of all concerned. The complete sanitary surveys of every camp, of every house, of all sanitary facilities, drainage, ditches, etc., are the most encouraging illustration of the attainable ideal in applied sanitary science. The rat-proofing of most of the houses on plantations is obviously the best safeguard against a

future recurrence of bubonic plague. The control by numbers of every plantation habitation is the most effective check yet devised for the prompt eradication and control of the first suspicious cases of contagious disease. It has been my privilege to examine personally perhaps half of the labor camps on the principal islands, and, broadly speaking, their conditions conform as nearly as possible to a reasonable ideal as could be expected in the case of a population largely of Oriental, or otherwise Asiatic, origin. It is something very considerably to the credit of the Hawaiian sugar planters that in this respect they should have set an example of humanitarian consideration and conformity to the exacting principles of sanitary science far in advance of most of the plantation housing conditions in the southern states of the mainland, or of Cuba and Porto Rico. It is even more to their credit that they should have provided better hospital facilities and free medical aid to a relatively low class of Oriental or Filipino labor on the Hawaiian sugar plantations than is available at the present time to most of the agricultural population, rich and poor, white and black, on the mainland of the United States. Such hospitals as are to be found on the island of Kauai at Lihue and on the island of Maui at Puunene challenge comparison with any similar institution as regards the equipment, nursing care, medical supervision, and even the keeping of card records, on the mainland. It is primarily due to the persistent efforts on the part of the planters to improve sanitary and housing conditions, hospital facilities and provide food at reasonable prices for plantation laborers, combined with adequate wages, free fuel, pure water, etc., and the hearty coöperation of an efficient and thoroughly well organized Territorial Board of Health that such far-reaching sanitary results have been achieved in recent years.

PART II

VITAL STATISTICS

The normal progress of the population of the Territory of Hawaii has been profoundly disturbed by immigration, and during comparatively recent years by the introduction of new racial elements, which proportionately have attained to predominating importance. In 1890 the pure Oriental population consisted almost exclusively of Chinese, and numbered 29,362, or 32.6 per cent. of the total population. During the intervening twenty years this element increased to 108,243, or 56.4 per cent. of the total, but of this proportion only 11.3 per cent. was Chinese, while 41.5 per cent. was Japanese. As recently as 1900 the Koreans and Filipinos were not separately enumerated, but in 1910 there were 4,533 Koreans and 2,361 Filipinos. During the intervening five years these two elements have further increased by immigration, aside from an excess of births over deaths. Combining the four years 1911-14 as given in the Governor's annual report, there have been 21,965 births in the Territory and 13,306 deaths, a net gain of births over deaths of 8,659. But there were 41,030 arrivals of immigrants and 28,975 departures, a net gain of immigration over emigration of 12,055. There was, therefore, a net gain due to an excess of births over deaths and of immigration over emigration of 20,714; or, in proportion to population, the annual natural increment in population was 10.3 per 1,000, and the additional annual increment by immigration was 14.4 per 1,000, or a combined gain of 24.7 per 1,000 per annum. It is therefore obvious that the factor of immigration controls the population increase in the Territory of Hawaii, rather than the factors of natural increment. The rate of natural increment varies widely for the different races, due chiefly to the varying age constitution of the population. Broadly speaking, the Chinese are an old people, and the Japanese are a young people. Of the former, 2.73 per cent. in 1910 was 65 years of age or over, against only 0.09 per cent. of the latter. Crude death rates for the several races are, therefore, quite certain to be either misleading or otherwise inconclusive. The Portuguese, who have been settled in the islands for many years, have attained to a fairly normal condition. Their immigration has materially diminished, while that of the Spanish has increased. The Porto

Rican element, at one time quite promising in numbers, has declined, largely because of a cessation of immigration and a continued return of immigrants to Porto Rico. The numerically most important population factor at the present time is the Japanese. The natural increase of this element alone contributes the largest share of children to the Territorial public schools. During the four years ending with 1914 there were 9,016 Japanese births, against 4,280 deaths. The excess of Japanese immigration over emigration, however, was relatively slight. A full consideration of all these factors would unduly enlarge the present discussion, but the facts require to be kept in mind in the correct interpretation of the statistical data presented.

As far as it is possible to determine, the registration of deaths in the Territory of Hawaii is complete, and in the main satisfactory regarding the accurate diagnosis of at least the principal causes. The hope may here be expressed that in the near future Hawaii will be included in the registration area of the United States, or at least that the registration returns will be printed separately but in a uniform manner in the annual reports on the mortality of the United States issued by the Division of Vital Statistics of the Census. The statistics as at present published fail to conform to the precise requirements for general comparative purposes with the data available for the mainland. It should not be a difficult matter to bring about an arrangement with the Census Office, whereby transcripts of the original death certificates could be sent to Washington for standard tabulation, analysis and annual publication in the report referred to. Such an arrangement would materially increase the practical utility of the data and make a vast amount of useful statistical information available to those interested in vital statistics and related problems.

For the present purpose the available data have been arranged in a uniform manner, and new rates have been calculated on the basis of careful population estimates for intercensal years. As far as practicable, all of the original data are included, so as to afford a convenient means for further analysis and the continuation of the tabulations in the future. The still-births are, of course, in all cases excluded from the calculation of mortality rates. The rates will vary slightly in many cases from those published in the annual report of the president of the Territorial Board of Health, which occasionally are on the basis of deaths excluding accidents, etc. It is sincerely to be hoped that this practice will in the future be discontinued.

Table 1 exhibits *the general death rate* in the Territory of Hawaii for the periods 1851-75 and 1900-15, there being no returns available for the entire Territory during the intervening years, nor are

the data available for 1864-65. The information is derived chiefly from the report of the Sanitary Commission published in 1912. As elsewhere pointed out, a maximum death rate was reached in 1853, of 109.7 per 1,000, which was soon followed by a minimum rate of 19.8 in 1854, subsequently to which there was a rapid rise and a long period of prevailing high rates of mortality, terminating in a second maximum of 64.8 per 1,000 in 1870, due to an epidemic of scarlet fever. The absolute accuracy of these returns for early years is, of course, open to question. The conclusion, however, seems entirely justified that throughout this long period of years the mortality was uniformly high, chiefly in consequence of smallpox, scarlet fever, and probably other acute infectious diseases of infancy, aside from the high death rate from fevers more or less ill-defined. The actual population during this period *diminished* from 73,138 in 1853 to 56,897 in 1872. The population at this time was largely native or half-caste, for even in 1872 only 1,938 Chinese were enumerated, and 3,428 foreigners of all other races, including Americans, the number of pure natives being 49,044 and of half-castes, 2,487. According to the census returns for 1872, the whole population had decreased 13.1 per cent. during the three years ending with 1853, 4.7 per cent. during the seven years following, ending with 1860, 9.67 per cent. during the six years following, ending with 1866, and 9.62 per cent. during the six years ending with 1872.

Table 2 exhibits *the general death rate of the city of Honolulu* since 1876, when a maximum rate of 68.2 per 1,000 prevailed, but some doubt exists as regards the accuracy of the mortality returns. The results have elsewhere been summarized by decennial periods and need not be further discussed except that attention may be directed to epidemics of measles and typhoid fever prevailing in 1880, when the death rate was 37.4, an epidemic of smallpox prevailing in 1881, when the death rate was 47.3, an epidemic of measles and dysentery prevailing in 1888, when the death rate was 25.1, an epidemic of diphtheria prevailing in 1890, when the death rate was 27.4, an epidemic of la grippe prevailing in 1892, when the death rate was 27.8, an epidemic of cholera in 1895, when the death rate was 26.3, and epidemics of plague in 1899 and 1900, when the death rates were, respectively, 31.2 and 32.8 per 1,000 of population. Since then there have been no serious epidemics, and since 1907 the death rate of the city has been below 20 per 1,000, except during the years 1911 and 1914. The death rates prevailing during recent years may safely be considered an index of a reasonably satisfactory sanitary administration, and in many respects exceptionally so, in view of the special local sanitary and racial problems of the city of Honolulu.

Table 3 presents *the mortality of the Territory by administrative divisions* for the five years ending with 1913. This table emphasizes the important conclusion that the death rate of the city of Honolulu is unquestionably increased by the admission of patients to the local hospitals from the surrounding territory. The death rate of the city of Honolulu was 20.2 per 1,000, while for the remainder of *Honolulu county* it was only 9.9. For the city and county combined the rate was 16.5 per 1,000, which may safely be considered satisfactory. For *Hawaii county* the rate was only 15.4. The island of Hawaii has for a number of years had the exceptional advantage of a sanitary officer of unusual ability. Mr. D. S. Bowman has been officially commended by the Surgeon-General of the United States Public Health Service for exceptional efficiency. Considering the plague invasion of the island and the practical elimination of rodent-plague cases during his administration, the rat-proofing of most of the plantation houses, the sanitary improvement of camps, etc., all combined furnish abundant reasons for special gratification at the results achieved. The high rate of 93.2 per 1,000 for *Kalawao county* is explained by the statement that this is the leper settlement on the island of Molokai, the remainder of the island being included within the jurisdiction of Maui county. The lowest death rate was experienced in *Kauai county*, which is not inappropriately called the "Garden Island." The low mortality is unquestionably, in a large measure, the result of an efficient sanitary administration, in active coöperation with the medical officers of the large plantations. As elsewhere pointed out, the hospital at Lihue challenges favorable comparison with any corresponding institution on the mainland. The climatological conditions of the island vary widely, and particularly the rainfall, which has a range from 168 inches as measured at the station on Wahiawa mountain to only 21.8 inches at Cape Kekaha, on the southern coast region. Less important differences occur in the variations of temperature conditions, but there are reasons for believing that the prevailing wind directions and degree of velocity have an important bearing upon the relative frequency of and fatality rate in certain diseases. The question is of special importance, in view of the proposed establishment of a sanatorium for the treatment of tuberculosis on the island of Kauai, which, it is sincerely to be hoped, will be placed in a strictly suitable situation regardless of the possibly higher expense to be incurred. *Maui county* has a death rate of 16.4 per 1,000, which, in view of the large Asiatic and native populations, may be considered a satisfactory index of efficiency in local sanitary administration. In this case also a strictly modern hospital at Puunene is a favorable factor of the first order of

importance. It is to be hoped that at some time in the future the statistical experience of this institution will be subjected to critical analysis and made public in aid of the study of specific disease frequency on the island of Maui.

Table 4 presents a brief *summary of the most prevalent causes of death* during the period 1909-13 in the Territory of Hawaii.* The analysis includes 12,540 deaths. The leading cause was pneumonia, accounting for 12.1 per cent., followed by tuberculosis, accounting for 11.3 per cent. The rates in proportion to population were 19.3 for pneumonia and 18.0 per 10,000 for tuberculosis. The corresponding rates for the United States registration area for the five years ending December 31, 1913, were 13.6 and 15.5, respectively. As elsewhere observed, no thorough study appears to have been made of the probable underlying reasons for the high incidence of pneumonia. Climatologically, it is difficult to understand why this disease should be so exceptionally common in a semi-tropical locality. The high mortality from tuberculosis concerns chiefly the natives, a conclusion which, however, also applies to pneumonia. Among other diseases of interest is cancer, which accounts for a rate of 4.1 per 10,000 of population, in comparison with 7.7 per 10,000 for the United States mainland. The rate must be considered relatively high, in view of the large native and Asiatic population. The death rate from typhoid fever was during this period 3.5 per 10,000, which must also be considered excessive. The corresponding rate for the mainland was only 2.0 per 10,000, and for the State of New York, 1.3. Infantile diseases prevailed to an undue degree, largely, no doubt, because of the ignorance and indifference among the mothers of the native and Oriental population. The death rate from leprosy was 2.7 per 10,000, which may be compared with 0.02 for the United States registration area, and 0.04 for the State of Louisiana, where the disease has been endemic for many years. With reference to the total mortality, however, leprosy, during the period under consideration, caused only 1.7 per cent. of the deaths from all causes.

In view of the importance of *tuberculosis*, *Table 5* exhibits the mortality from this disease *by administrative divisions*. The rate for the city of Honolulu is shown to have been 31.9 per 10,000 of population, compared with an average of 18.1 for the Territory, and 23.2 for the city and county of Honolulu combined. Obviously many of the patients from the surrounding territory on the island of Oahu are brought to Honolulu for sanatoria treatment. The rate was very

*The rates here given will be found to differ slightly from the rates given in the statistical section which covers a different period of years.

low in Kalawao county at the leper settlement. In the three remaining counties the lowest tuberculosis rate prevailed on the island of Hawaii, or 13.0 per 10,000, followed by the island of Kauai, with 14.8, and the island of Maui, with 16.1. Since the race factor in tuberculosis is of the first order of importance, it is necessary to take this fact into account in efforts to arrive at a satisfactory explanation regarding the reasons for local variations in the death rates from the disease.

For the purpose of illustrating the changes in the death rate during recent years, partly, no doubt, in consequence of improved efficiency in sanitary measures and public health control, *Table 6* presents the mortality from *tuberculosis in the Territory of Hawaii* since 1900. During the period under consideration the rates have varied between a maximum of 21.6 per 10,000 in 1904 and a minimum of 15.2 in 1915. A rate nearly as low, or 16.0, however, was reached in 1913. During 1914 the rate increased again to 18.5. In part this increase may possibly be attributable to changes in the methods of diagnosis and the institutional treatment of tuberculous patients at the Leahi Home. As a general conclusion, however, it would seem safe to hold that there has not been the improvement in the tuberculosis situation which might have been expected, in view of the activities of the Anti-tuberculosis Association and continued effort to bring the salient facts of the methods of tuberculosis prevention to the attention of the public. It must be kept in mind, however, that the problem of prevention is infinitely more difficult when applied to native races or to Orientals, more or less indifferent to even the most simple and well-directed efforts at public health education. The fact remains that tuberculosis continues to prevail in the islands to an excessive degree regardless of favorable climatic conditions, which permit of an outdoor life throughout practically the entire year, and in the larger portion of the different islands at the lower elevations. The rate, however, must be considered excessive in a rather relative sense. The average rate for 1910-13 was 18.0 per 10,000 of population, which compares with 15.5 for the United States registration area. Since native races and Orientals are decidedly more liable to tuberculosis than Americans and Europeans, attention may be directed to the fact that in thirty southern cities of the mainland of the United States the death rate of the white population from tuberculosis of the lungs was 15.8 per 10,000 of population, against 41.5 for the colored population. The rates, of course, would be somewhat increased by the inclusion of deaths from tuberculosis other than the pulmonary type. There are, however, so many climatological and rural circumstances in Hawaii favorable to a low normal tuberculosis death rate that the foregoing illustration must

not be carried too far. It may be pointed out that, of the total population of the Territory, 69.3 per cent. is rural; and of the most important racial element, that is, the Japanese, 81.3 per cent. live outside of the larger cities. A factor of some importance which may have a bearing upon a high tuberculosis death rate is the excessive proportion of males of the age periods at which tuberculosis is most common. In the United States registration area the mortality rate from tuberculosis of the lungs during 1903-12 was 16.0 per 10,000 of population for males, against 13.2 for females; but at the age period 45 and over the rate was 23.4 for males, against 13.8 for females. In the Territory of Hawaii the excess of males over females is 79 per cent. for all races. The excess is most pronounced for the Orientals and other Asiatics, including Filipinos, for among the latter in 1910, for illustration, there were 2,135 males to only 226 females. Among the Koreans there were 3,931 males to 602 females. Among the Japanese there were 54,784 males to 24,891 females. Finally, among the Chinese there were 17,148 males to 4,526 females. All of these and many other facts require to be kept in mind in a correct interpretation of crude mortality statistics.

Table 7 exhibits the mortality from *typhoid fever by administrative divisions*. The rate during 1908-13 was highest on the island of Hawaii, or 7.1 per 10,000 of population, which compares with an average rate of 4.4 for the Territory as a whole and 3.3 for the city and county of Honolulu combined. The corresponding rate for typhoid fever in the United States registration area was 2.0 per 10,000 of population. It is interesting to note that not a single death from typhoid occurred at the leper settlement on the island of Molokai.

In contrast to a not far from stationary mortality from tuberculosis during very recent years, there has been a marked *decline in typhoid fever*. As shown by *Table 8*, the death rate has decreased from 12.9 per 10,000 in 1900 to 1.9 in 1912, and 2.5 during 1913 and 1914, and 1.8 in 1915. The rates now prevailing must be considered distinctly favorable, in view of the predominating native and Asiatic elements. For the United States registration area the typhoid fever death rate was 2.0 per 10,000 of population, but in this case also the factor of an excessive male population must be considered, for, as is well known, typhoid is more common among men at ages 15 and over than among women. At ages under 15 the rates are slightly higher for females. The race factor also is of importance, for as shown by the returns for thirty southern cities, the typhoid mortality of the white population was 3.7 per 10,000, against 5.1 for the colored. The prevailing rates in the southern states on the mainland are distinctly higher than

in the Territory of Hawaii. The progress which has been made in this respect is conclusive evidence that in the main the sanitary efforts have been in the right direction, and that, broadly speaking, the sanitary control of the local situation has become effective.

Table 9 deals with the problem of *leprosy*, which in Hawaii has rightfully demanded prior consideration as a public health question for more than sixty years. With a wisdom and courage far in advance of many other countries Hawaii fortunately decided upon a policy of absolute segregation, to which, in the main, must be attributed such a reduction in the frequency of the disease as has gradually been achieved. Leprosy is by far the most difficult disease to eradicate. Its precise mode of spreading remains unknown, although the bacillary nature of the disease has been established beyond a doubt. The principle of contact infection is unquestionably sound, for, as far as known, cases do not originate spontaneously, but one case is always, with more or less certainty, traceable to another. Regardless of the somewhat doubtful accuracy of the Norwegian statistics, in view of the probable emigration of lepers from Norway to the United States, or elsewhere, there can be no question of reasonable doubt that the policy of segregation has been the means of reducing materially the local frequency of the disease. The experience at Tracadie, New Brunswick, shows that during fifty years, at least, the number of cases has not increased and the actual number of cases under control has diminished. It may be questioned whether segregation has ever been entirely effective in Louisiana, but evidence is not wanting that the policy of such segregation as has been practiced has been distinctly beneficial. Segregation, however, is not only for the purpose of control and reduction, but is also highly commendable on humanitarian grounds. The leper's lot is infinitely worse when he is at large than when he is placed under conditions of effective segregation, with appropriate facilities for medical, surgical and nursing treatment. What has been done at Molokai rightfully challenges the admiration of the world. In the light of my own personal visit to the settlement, as well as to leper settlements on the mainland, Panama, Costa Rica, Jamaica, etc., I feel absolutely convinced that the only solution of the leper problem lies in the direction of complete segregation, and I am satisfied that this view is fully shared by the large majority of the lepers themselves. With the highest regard for the work of Father Damien, I feel strongly that inadequate justice has been done to the not inconsiderable number of unknown men and women who have given themselves to the service of a cause than which none is more entitled to our sympathy and generosity. The modern service which is

rendered by the superintendent of the settlement, by the physician in charge, by the mother superior and the priests and nuns, as well as the lay helpers, is unquestionably decidedly more effective, more humane and more considerate than the service rendered by Father Damien, even though in the aid so rendered he sacrificed his own life. The heroism of a saint may challenge our admiration, but it is trained service, combined with courage and superior intelligence, that alone is ever likely to achieve results that are really worth while.*

In 1902 the number of deaths from leprosy in the Territory of Hawaii, in proportion to population, was 5.0 per 10,000, and the average for the five-year period ending with 1906 was 3.6. During the intervening years the rate has gradually been reduced to 2.4 during 1909, 1911 and 1912. During 1914 there was a slight increase in the rate to 2.7, or just about one-half the rate of thirteen years ago, but in 1915 the rate was only 1.7. A full account of the leprosy problem in Hawaii lies outside of the present discussion. The local importance of the problem is best illustrated in the statement that for the year 1914 the number of known lepers per 100,000 of population was 4.9 for Louisiana, 48.6 for the Philippines, 142.0 for British Guiana, and 301.2 for the Territory of Hawaii. On June 30, 1914, the number of lepers at the Molokai settlement was 666, and of this number 409 were males and 257 were females. Of the total, 446, or 67.0 per cent., were pure Hawaiians; 104, or 15.6 per cent., were part Hawaiians; 43, or 6.5 per cent., were Portuguese; 35, or 5.3 per cent., were Chinese; 13, or 2.0 per cent., were Japanese; and 8, or 1.2 per cent., were Koreans. Of the remainder of 17 lepers, only 3 were Americans, 1 was a British negro, 6 were Germans, 1 was a Gilbert Islander, 3 were Porto Ricans, 1 was a Russian, and 2 were Spanish. The descriptive accounts of this settlement which have been published are far from having done complete justice to what has been done and is being done in an effort to make a tragic situation as bearable as possible. Contrary to frequent assertions, there is nothing that reminds any one of a living tomb, nor are the conditions such as to impress even the most unfortunate one with a feeling of hopeless isolation. There are no extreme measures of contact avoidance—in fact, there is more discussion of leprosy, more fear of contagion, outside of the settlement than in it. Not all of those who go to Molokai remain there, for some have been discharged as permanently cured, or, in any event, as being in a completely arrested condition without fear of recurrence.

*For an extended discussion of Leprosy as a national and international problem, including a large amount of statistical information on leprosy throughout the world, see United States Senate Report No. 306, 64th Congress, 1st Session, Washington, 1916.

To avoid possible diagnostic errors, reëxaminations are made from time to time by a board of physicians, and some are given their liberty on being declared free from the specific bacillus of the disease, though subjected to the necessity of reporting periodically to a government physician for physical inspection, and further bound by a few minor restrictions owing to the presence of former lesions. During 1913 four persons were declared non-leprous, and five were declared paroled. Thus progress is being made, and the outlook is distinctly hopeful.

The statistics of the leper settlement at Molokai, on account of their exceptional importance, are presented in detail in *Table 10*, as to admissions, deaths and numbers remaining, for the entire period 1866-1915. The table includes the leprosy rate calculated per 1,000 of population, showing the gradual increase from the commencement of the settlement to the first maximum reached in 1873 and to a second maximum reached in 1890. Subsequently to that year, when the rate reached 13.48 per 1,000, the rate has gradually declined to only 2.76 during the year 1915.

The *bubonic plague* appeared in Hawaii for the first time on December 12, 1899. *Table 11* presents the mortality in detail for the period 1902-15. During these fourteen years there have been 198 deaths. The maximum mortality rate of 2.3 per 10,000 of population during the period under observation occurred in 1902, and the minimum rate of 0.04 occurred in 1915. No death was reported during 1909, and only three deaths in 1914. Since then, it is gratifying to be able to say, the disease has been practically eradicated, the last death from bubonic plague having been reported from the island of Hawaii during the month of August, 1914. Only three new cases were reported during the fiscal year ending June 30, 1914, from the island of Hawaii, and of these only two were actually verified. During the following fiscal year only one case of plague was reported. The rat campaign throughout the islands has been continued in an effective manner, but the reduction in the force of trappers employed must be considered with some apprehension. It may be interesting in this connection to state that, according to the rat-campaign experience in Honolulu, 75 per cent. of the rats were trapped in fields, open lots and near stone fences, 19 per cent. in gulches and ravines, and only 4 per cent. in houses and barns, and 2 per cent. in trees or unknown places. The cost per rat caught was approximately 22½ cents. In the district of Honolulu the last plague-infected rat was caught in April, 1910. It is to be hoped that some time in the future a full account regarding bubonic plague in Hawaii will be published. It is true that the available statistical information, aside from

a vast general literature, may be considered practically conclusive, especially the extremely valuable report of the International Plague Conference, held at Mukden in April, 1911, the report on the Bacteriology, Morbid Anatomy, and Histopathology of the Plague, published by the Philippine Biological Laboratory, and the report of the Citizens' Health Committee on the Reduction of Plague, in San Francisco. But in its final analysis, the control of plague, cholera, leprosy, etc., is everywhere a local question, which for its ultimate solution depends upon a thorough understanding of the special facts derived from local experience. What may be the best possible policy in connection with the extermination of plague in Manchuria may fail to meet special requirements in Hawaii or on the mainland. Granting that the possibility of epidemic plague recurrence in Hawaii is practically out of the question, it is self-evident that the prevention of such recurrence depends entirely upon the continued and exceptional efficiency of the Federal and Territorial health administrations. It may be interesting in this connection to direct attention to the comparative plague mortality during the decade ending with 1912, which, according to the available returns, was 0.5 per 100,000 of population for California, 8.2 for Hawaii, 14.1 for Manila, and 25.1 for British India.

The subject of *beriberi* appears never to have received extended medical or sanitary consideration in Hawaii. Deaths from this disease have been reported for quite a number of years, and in *Table 12* the facts have been brought together for the period 1902-15. During the fourteen years under observation there have been 519 deaths from beriberi, as far as reported. A maximum death rate of 3.7 per 10,000 of population occurred in 1902, and a minimum rate of 1.1 in 1912, but since that year the rate has doubled, having reached a new maximum of 2.2 in 1914, the rate for 1915 being 1.8. Against 22 deaths in 1912, there were 35 in 1913, 49 in 1914, and 42 in 1915. In part this increase is attributable to the recent introduction of Filipino plantation laborers, numbering 13,931 males, during the five years ending with 1914. It is claimed that the disease is less fatal in Hawaii than in other tropical countries. Beriberi is described as a form of multiple peripheral neuritis, occurring endemically or as an epidemic in most tropical and subtropical countries, and also under certain conditions in more temperate latitudes. The chances of erroneous diagnosis are considerable. Even the term "malarial neuritis" is occasionally used. In some epidemics, according to Manson, the mortality has been as high as 30 per cent., and in others as low as 5 per cent., and even less. Modern research, especially the work done

by Vedder in the Philippines and by Fraser and Stanton in the Federated Malay States, has established beyond a doubt that the disease is primarily a dietary or nutritional disorder. Yet as recently as May 27, 1915, the Board of Health of the City of New York sent 26 cases of beriberi from a British freighter to the quarantine station for observation and ordered the vessel to be fumigated. In contrast, the same Board of Health permits some 50 leprous cases to go at large, without effective institutional segregation! Even though the disease be a protozoan infection, it is thoroughly well understood that in such a case the urine would be the source of infection, with practically no chance whatsoever of spreading the disease. All hypotheses, however, are of slight significance, in view of the indisputable evidence concerning the correlation of malnutrition, or some defect in food, chiefly polished rice, as a primary cause of beriberi. The preventive measures adopted in the Philippines and elsewhere prove conclusively that the disease can be brought measurably under control. It is to be hoped that more determined efforts will be made in this respect in Hawaii, not only on humanitarian, but also on economic grounds, since, after all, a not inconsiderable amount of useful labor and of time are needlessly lost on account of the continued frequency of this preventable disease.

It may be questioned whether anywhere in the world a more complete mingling of races has taken place than in Hawaii. Not only has there been a large amount of intermixture of all classes of Europeans with native Hawaiians, but the latter have intermixed or intermarried with Orientals of all classes, of course with a varying degree of intermixture. The *marriage statistics of Hawaii* are extremely interesting and indicate the lines of race-mingling with at least approximate precision. For illustration, out of 210 American grooms married in Hawaii during 1914, only 53.3 per cent. married American women, 11.9 per cent. married Caucasian-Hawaiian women, 11.9 per cent. married Portuguese women, 5.2 per cent. married full-blood Hawaiian women, 1.9 per cent. married Chinese-Hawaiian women, 1.4 per cent. married pure Chinese women, 1.9 per cent. married Porto Rican women, and the remainder included British, Filipino, French, German, Japanese, Mexican-Portuguese, Norwegian, Spanish and Swedish women. By common consent, the intermixture of native women with pure Chinese has produced a physically and morally superior type. Less conclusive are general observations concerning results of the intermingling of other races in Hawaii. The Chinese first came to the islands in 1852, chiefly from the southern provinces of China. According to the census of 1910, there were 3,734 Asiatic

Hawaiians, that is, the offspring chiefly of Chinese fathers and Hawaiian mothers. Thus far there has been practically no intermixture on the part of the Japanese with the natives. The total number of pure Chinese in Hawaii in 1910 was 21,674, but, in contrast, the Japanese, though of much later introduction, number 79,675. The Caucasian-Hawaiian, however, is of the first order of importance, and there are strong indications that in the main the type is physically above the average. According to Ernest J. Reese, in a thoughtful contribution to the "Journal of American Sociology" for July, 1914, "there is no greater susceptibility to disease than is usual in races forced into contact with new contagions," and "in spite of the disparity between the cultured standards of the contributing races it is certain that the Caucasian-Hawaiian is not inferior to both." The same writer observes with reference to Chinese-Hawaiians that "there can be no question that, measured by western economic requirements, the Chinese-Hawaiian is far superior to both of the elements in his make-up." The third most important element is the Portuguese, who have become thoroughly assimilated. A large proportion of these came originally from a Portuguese possession off the west coast of Africa. In 1910 the number of Portuguese was 22,301. It is pointed out in the census report (1910) that "the large proportion with foreign-born fathers among the part Hawaiians of mixed native and foreign-born parentage may be noted as specifically indicative of the process by which the native Hawaiian stock is being merged with other races."

These and other important anthropological facts require to be kept in mind in an effort to interpret the available race-mortality statistics for the Territory of Hawaii. *Table 13* is introductory to the tables and discussion following and is merely intended to show the crude death rate for the pure Hawaiian, part Hawaiian, Chinese, Japanese and Portuguese populations, with the required factor for correction, and the *corrected or standardized death rates*, which make allowance for differences in the age and sex constitutions of the populations considered. As elsewhere pointed out, these two factors are of exceptional importance in Hawaii, in view of the preponderance of males and the large proportion of aged persons among the Chinese and the correspondingly small proportion of the old among the Japanese. When allowance is made for these facts, it appears that for the period 1908-13 the standardized death rate for all races combined was 18.47 per 1,000, the highest rate being shown to have prevailed among the pure Hawaiians, or 34.41, and the lowest among the Chinese, or 11.47 per 1,000. Next in the order of importance are the part Hawaiians, with a rate of 13.55, followed by the Portuguese, with 14.70, and the Japanese, with 16.61 per 1,000.

For the other racial elements of the population the respective numbers are too small to warrant safe conclusions.

Table 14 exhibits in detail *the mortality of Hawaii for all races* by divisional periods of life, with a due regard to sex and age, standardized with England and Wales as a basis of comparison. This table, which will facilitate future calculations, brings out the important fact that the standardized death rate for all races in Hawaii was 18.03 per 1,000 for males and 20.08 for females, or 18.47 for both sexes combined.

Table 15 shows the corresponding information for *pure Hawaiians*. The fact is brought out that the male mortality rate for this element is 32.33 per 1,000; for females, 37.92; and for both sexes combined, 34.41.

Table 16 shows the corresponding information for the *pure Chinese*, and the interesting fact is brought out that the mortality rate for both sexes was nearly the same, or 11.94 per 1,000 for males and 12.12 for females, being 11.47 for both sexes combined.

Table 17 is for the *Japanese*, and shows that the male mortality rate for this element was 15.90 per 1,000, the female rate was 18.72, and the combined rate was 16.61.

Finally, as a somewhat interesting contrast, *Table 18*, for the *Portuguese*, shows that the male rate for this element was 15.83 per 1,000, but the female rate was only 13.59, and for both sexes combined the rate was 14.70.

Table 19, for the *part Hawaiians*, shows that the rate for males was 13.10 per 1,000; for females, 14.13; and for both sexes combined, 13.55.

These rates, it requires to be kept in mind, are standardized for variations in the age constitution, and they are therefore conclusive as far as the accuracy and completeness of the returns can be relied upon. Unfortunately, the standardizing of death rates is rather an involved and time-consuming statistical process, and it has not been feasible to apply a factor of correction to the tables following for specified causes, in which the sexes have been combined to provide a larger number of deaths for the principal races concerned.

Table 20 shows the mortality from *tuberculosis by race*, the average rate for all races having been 17.6 per 10,000; the maximum rate was 51.7, for pure Hawaiians, followed by 17.6 for part Hawaiians, 12.6 for the Chinese, 12.0 for the Japanese, and only 5.8 for the Portuguese.

Table 21 shows the mortality rate from *pneumonia*. The average rate for all races was 19.2 per 10,000, the maximum rate having been 50.6, for the pure Hawaiians, followed by 21.0 for the part Hawaiians, 17.4 for the Portuguese, 14.5 for the Japanese, and only 8.8 for the Chinese.

Table 22, recording the mortality from *acute and chronic nephritis*, which, however, requires to be considered in connection with the table following, for valvular diseases of the heart, shows that the average mortality rate for all races was 6.8 per 10,000. The maximum rate of 17.1 prevailed among pure Hawaiians, followed by 9.3 for the Chinese (partly on account of age), 7. 7 for the part Hawaiians, 4.5 for the Portuguese, and only 3.9 for the Japanese (partly on account of the small proportion of persons of ages over 50).

Table 23 shows the mortality from *valvular diseases of the heart*, the average rate for all races was 6.1 per 10,000, the maximum rate having been 20.8, for the pure Hawaiians, followed by 5.5 for the Chinese, 4.7 for the Portuguese, and only 2.0 for the Japanese, and 1.1 for the part Hawaiians.

The mortality from *cancer* is of exceptional interest. According to *Table 24* the average rate during 1911-13 for all races was only 3.8 per 10,000, but for the pure Hawaiians the rate was 9.4, followed by 5.8 for the Portuguese, 2.7 for the part Hawaiians and for the Chinese, and only 2.0 for the Japanese. In view of the fact that the average mortality from malignant disease in the United States registration area is 7.7 per 10,000 of population, it is extremely significant that among the pure Hawaiians the prevailing rate should be 9.4.

In view of the world-wide interest in the cancer problem an additional table has been provided showing the proportionate mortality from cancer, by organs and parts and according to race. As shown by *Table 25*, among the pure Hawaiians 29.4 per cent. of the deaths from malignant disease was due to cancer of the uterus, followed by 27.5 per cent. for cancer of the stomach, and 13.7 per cent. for cancer of the breast. Among the Portuguese, Chinese and Japanese, most of the recorded deaths from cancer were of the stomach, uterus, liver and intestines. In other words, such deaths as were recorded among these elements were chiefly cancers of the inaccessible organs. It is, therefore, a safe assumption that, in the main, the low rate among these elements is not attributable to serious errors in terminal diagnosis or defects in death certification. Since cancer is relatively very rare among primitive races, it is extremely suggestive that, after more than a century of contact with Europeans, the native Hawaiians should have attained to a cancer mortality even in excess of the corresponding cancer death rate of the registration area of the United States. The same tendency towards a rapid increase in the mortality from cancer has been observed in the United States among the American negroes during their period of freedom, and attention may be directed to the fact, not generally known, that cancer of the

uterus is now relatively more common among negro women, in the large cities of the South at least, than among white women in the same locality. The extreme rarity of cancer of the breast among Japanese women may also be referred to as a most interesting phase of the cancer problem, which has heretofore received inadequate consideration. A thorough study of the mortality from cancer in the Territory of Hawaii would therefore make an extremely valuable and interesting contribution to the cancer cause.

As elsewhere observed, leprosy is chiefly confined to the pure and mixed-blood Hawaiians and the Orientals. *Table 26* shows the mortality from *leprosy by race*. The average rate for all races was 2.4 per 10,000 of population, the highest rate occurring among the pure Hawaiians, or 15.3, followed by a rate of 1.5 for the Chinese, 1.1 for the part Hawaiians, 0.4 for the Portuguese, and 0.1 for the Japanese. While very rarely cases have occurred among the Americans and Europeans, as a general principle the disease in Hawaii is chiefly limited to the native and Chinese elements. The risk of contracting leprosy, while very slight, is, however, general, and the rarity of the disease among Americans and Europeans does not warrant the least toleration of indifference towards accepted principles of leper segregation and control.

In *Table 27* the mortality from *arterio-sclerosis* is shown by race, but the term is as yet of somewhat doubtful meaning in general medical practice, and it may be questioned whether the data are entirely conclusive. The average mortality rate for all races was 1.4 per 10,000 of population, the rate having been highest for the pure Hawaiians, or 5.3, followed by a rate of 1.9 for the Portuguese, 1.8 for the Chinese, and 0.8 for the part Hawaiians. There were no deaths from arterio-sclerosis among the Japanese during the period under observation.

The crude death rate is invariably conditioned by the age and sex distribution of the population. The specific rates vary according to sex at every divisional period of life. The rates for females are almost invariably below the corresponding rates for males. For all ages the white male death rate for the registration area is 15.3 and the white female death rate is 13.4 per 1,000. Material variations in the age and sex distribution of the population must, therefore, seriously affect the crude death rate. It has, however, not seemed feasible to calculate specific death rates by divisional periods of life for each sex, but the tables following (Nos. 28-32) will serve the required purpose on this occasion.

Table 28 shows the *mortality by age periods for the pure Hawaiians*. The mortality rate at ages under five was 100.2 per 1,000, which

compares or, rather, contrasts with a corresponding rate of 36.0 per 1,000 for the United States registration area.

Table 29 shows that for the part Hawaiians the *infantile mortality rate* was only 36.4 per 1,000, which compares with a rate of 36.0 for the United States registration area, previously referred to. In other words, in a large measure the excessive mortality of the pure Hawaiians is attributable to a very high mortality in infancy. But in comparing the specific rates by divisional periods of life, it appears that throughout life the mortality rate of pure Hawaiians is in excess of the corresponding rates for part Hawaiians.

Table 30 shows the *mortality of the Portuguese by age periods*. According to this table the infantile mortality rate was 46.2 per 1,000, or 9.8 in excess of the corresponding mortality for the part Hawaiians, but still less than one-half of the infant mortality of the pure Hawaiians. By divisional periods of life the rates are somewhat more favorable for the Portuguese at the important ages 20 and over, and distinctly so at ages 50-69.

Table 31 shows the *mortality from all causes, by age and race, for the Japanese population*. The infantile mortality of 54.6 per 1,000 was decidedly in excess of the corresponding mortality of the part Hawaiians and Portuguese, but only a trifle more than one-half the infantile mortality rate of the pure Hawaiians. The rates by divisional periods of life are based upon rather limited data, and they must be accepted with some caution. The comparatively recent introduction of the Japanese population into Hawaii also has a bearing upon this aspect of the mortality problem.

Table 32 is for the *Chinese*. The infantile mortality rate of this element was slightly below that of the Portuguese and practically throughout life the specific death rates are distinctly favorable, and decidedly more so than for the full-blood and part Hawaiians as well as the Japanese. By every statistical method which can be applied to the problem under consideration the Chinese element in Hawaii is apparently the most resistant to disease.

Additionally to the foregoing considerations, *Table 33* has been included to show *the birth rate by race* on the basis both of the entire population and of the female population ages 15-49. According to this table the average birth rate for the total population was 25.1 per 1,000, the maximum rate of 32.4 being shown to have prevailed among the part Hawaiians and the Portuguese. Corrected, however, for variations in the age and sex constitutions of the population, it appears, on the basis of the female population ages 15-49, that the birth rate was highest for the Chinese, or 227.0 per 1,000, followed

by a rate of 146.8 for the Portuguese, 144.2 for the part Hawaiians, 133.4 for the Japanese, and 88.4 for the pure Hawaiians. For the pure and part Hawaiians combined the birth rate was 104.5 per 1,000, against a rate of 130.6 for all races combined. The relative fecundity, therefore, was highest among the Chinese and lowest among the pure Hawaiians.

As an additional statement regarding *the infantile mortality*, limited to deaths at ages under 1 year, *Table 34* has been included, showing the percentage of deaths at this period of life in proportion to the births. As far as known the births are recorded with approximate accuracy. This table includes the data for a few additional races and nativities. It is shown that the proportion of infantile deaths was highest among the Filipinos, or 74.6 per cent., which conforms to the experience which has been had in the Philippine Islands. The efforts which have been made in Manila and elsewhere to control the situation by means of a rational educational campaign, and even drastic administrative methods, should be followed in Hawaii in a deliberate effort to bring about a material reduction in the preventable deaths in infancy. Next to the Filipinos stand the Hawaiians, with a proportion of 34.0 per cent., followed by the Japanese, with 18.2 per cent. The lowest figures, as would naturally be expected, are for the Germans, Americans and British.

The morbidity and mortality of *the United States Army in the Hawaiian Islands* are of considerable local interest and importance. A few tables have been included for the purpose of illustrating the essential facts of Army morbidity and mortality experience during the period 1904-14. *Table 35* conclusively shows that there has been a continuous improvement in the discharge rate, which has gradually declined, while the average death rate has been reduced to 1.8 per 1,000. *Table 36* exhibits the morbidity and discharges by principal diseases and injuries on the basis of the aggregate mean strength of 14,813. *Table 37* presents the morbidity and discharges in complete detail. Attention is directed to the relatively high rate of discharge on account of venereal diseases and alcoholism. The fact requires to be kept in mind, however, that a considerable proportion of the troops stationed in Hawaii are colored. This table for the first time makes available a large amount of additional information concerning disease frequency in Hawaii, but it must be used with caution for purposes of comparison with the corresponding data for the general population. A suggestive fact may be pointed out in this connection, that specific mention is made of 97 admissions to the sick report on account of malaria, equivalent to a rate of 6.5 per 1,000. There were also 14 cases of amoebic dysentery

and 28 cases of dengue. Not a single case of beriberi occurred in the army, nor is there record of a case of leprosy, plague or cholera, although the experience considered includes the years in which plague, at least, was relatively common.*

Tables 38 to *40* present in a convenient form the quarterly temperature and the quarterly rainfall data for Hawaii, with a special regard to geographical considerations and topography, also the temperature and rainfall data of Honolulu, by single years, during 1905-15. The data have been especially calculated for the present purpose from the original returns as published by the U. S. Weather Bureau. They prove conclusively the relatively wide variation in climatological factors, particularly rainfall, which is shown to vary from an annual maximum of 248.4 inches at Keanae Valley, island of Maui, to a minimum of 20.8 inches at Waianae, island of Oahu. A comprehensive scientific study of the correlation of weather conditions to health and mortality throughout the island will not be possible, however, until complete topographic atlas sheets have been published for every island, only a few maps having thus far been issued by the U. S. Geological Survey.

Conclusions: The foregoing account of the sanitary progress and the vital statistics of Hawaii is necessarily incomplete. Many of the original documents and reports which would be extremely useful and instructive for such a purpose have not been available. It is to be hoped that in course of time a more comprehensive account will be prepared in conformity to the admirable principles of presentation adopted by the Sanitary Commission of 1912. It would be well worth while to reprint some of the earlier reports, or at least the essential portions of the same, as a contribution to sanitary and medical science. It may also be suggested that some of the earlier reports on leprosy, as originally published in the Honolulu "Advertiser and Bulletin," or in the form of appendices to the earlier annual reports of the Board of Health, should be reprinted. It is especially desirable, however, that a full account of the plague epidemic of 1899 should be made public, as a useful contribution to the etiology and administrative control of this important disease. The results of the present consideration reflect the broad-minded, humanitarian policy of Hawaii under the monarchy, the provisional government, the republic and since the islands became a possession of the United States. The future possibilities of Hawaii as a health resort are practically without limit, and the same conclusion

*Local U. S. Army morbidity statistics are, of course, affected by previous service at other army posts, and this applies with special force to previous service in the Philippines, which may explain the admissions to sick report for malaria.

applies to the unrealized possibilities of Hawaii as a field for the study of the milder forms of tropical or semi-tropical diseases. The increasing importance of Hawaii from a military point of view makes the local sanitary progress a matter of importance to the Federal government. The limited use which has been made of the leprosy investigation station at Molokai suggests the transfer of some of the buildings and other property to the Territorial health authorities, for the more efficient and comfortable care of the lepers at the Kalaupapa settlement. What has been done by the Territory for this most afflicted class of human beings challenges the admiration of the world. The financial burden carried by Hawaii on account of its lepers is out of all proportion to its means, and it is to be hoped that in course of time the care of lepers throughout the mainland of the United States and all its insular possessions will be made a matter of Federal concern. The modern results at Molokai are jointly the achievements of Governor L. E. Pinkham, Dr. J. S. B. Pratt, president of the Territorial Board of Health, Mr. J. D. McVeigh, superintendent of the settlement, and Dr. W. J. Goodhue, resident physician, assisted by the many religious and lay workers, men and women, who by their self-sacrifice have made possible such results by a humanitarian treatment of leprosy under conditions of segregation, with the definite assurance of comfort, relief, and even cure.

Aside from these special considerations, it may be asserted without the slightest fear of successful contradiction that nowhere in the world is there a group of islands more blessed with a genial climate and superior health and sanitary conditions than what is justly called "The Paradise of the Pacific." The public health progress and the eradication and control of the more serious tropical and semi-tropical diseases reflect the highest achievements of American medicine, surgery and sanitary science in active and effective coöperation with an intelligent, broad-minded and generous people, strongly under the constructive influence of American ideals of good government and public welfare.

PART III

STATISTICAL APPENDIX

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Table No. 1

MORTALITY FROM ALL CAUSES IN HAWAII
1851-1875 and 1900-1915

Calendar Year	Population	Deaths	Rate per 1,000 Pop.
1851	80,489	5,792	72.0
1852	76,813	2,822	36.7
1853	73,138	8,026	109.7
1854	72,661	1,439	19.8
1855	72,184	1,685	23.3
1851–1855	375,285	19,764	52.7
1856	71,707	1,479	20.6
1857	71,230	2,017	28.3
1858	70,753	2,104	29.7
1859	70,275	2,291	32.6
1860	69,800	2,343	33.6
1856–1860	353,765	10,234	28.9
1861	68,600	2,249	32.8
1862	67,520	2,426	35.9
1863	66,520	2,657	39.9
1864	65,240	....	...
1865	64,100	....	...
1861–1865	331,980	....	...
1866	62,959	2,941	46.7
1867	61,900	2,610	42.2
1868	60,900	3,351	55.0
1869	59,900	3,528	58.9
1870	58,900	3,819	64.8
1866–1870	304,559	16,249	53.4
1871	57,900	3,502	60.5
1872	56,897	3,083	54.2
1873	57,078	3,036	53.2
1874	57,259	3,043	53.1
1875	57,440	3,262	56.8
1871–1875	286,574	15,926	55.6
1900	154,001	2,376	15.4
1901	157,790	3,029	19.2
1902	161,581	2,578	16.0
1903	165,372	2,657	16.1
1904	169,163	2,781	16.4
1900–1904	807,907	13,421	16.6

*January to June only.

Table No. 1—Continued

Calendar Year	Population	Deaths	Rate per 1,000 Pop.
1905	172,954	2,686	15.5
1906	176,745	2,854	16.1
1907	180,536	3,065	17.0
1908	184,327	2,820	15.3
1909	188,118	2,801	14.9
1910*	95,560	1,547	16.2
1905–1910	998,240	15,773	15.8
Year Ending June 30			
1911	196,714	3,296	16.8
1912	204,826	3,071	15.0
1913	213,438	3,232	15.1
1914	222,567	3,707	16.7
1915	229,300	3,556	15.5
1911–1915	1,066,845	16,862	15.8

Table No. 2

MORTALITY FROM ALL CAUSES IN THE CITY OF HONOLULU
1876-1915

Calendar Year	Population	Deaths	Rate per 1,000 Pop.
1876	14,384	981	68.2
1877	14,300	624	43.6
1878	14,114	555	39.3
1879	15,174	638	42.0
1880	16,234	607	37.4
1876–1880	74,206	3,405	45.9
1881	17,294	818	47.3
1882	18,354	542	29.5
1883	18,414	633	34.4
1884	20,487	567	27.7
1885	20,890	551	26.4
1881–1885	95,439	3,111	32.6
1886	21,293	573	26.9
1887	21,693	593	27.3
1888	22,099	555	25.1
1889	22,502	548	24.4
1890	22,907	627	27.4
1886–1890	110,494	2,896	26.2
1891	24,076	652	27.1
1892	25,245	701	27.8
1893	26,414	555	21.0
1894	27,583	617	22.4
1895	27,752	731	26.3
1891–1895	131,070	3,256	24.8

Table No. 2—Continued

Calendar Year	Population	Deaths	Rate per 1,000 Pop.
1896	29,920	673	22.5
1897	32,266	659	20.4
1898	34,612	926	26.8
1899	36,985	1,153	31.2
1900	39,306	1,290	32.8
1896–1900	173,089	4,701	27.2
1901	40,594	1,125	27.7
1902	41,881	971	23.2
1903	43,169	864	20.0
1904	44,456	925	20.8
1905	45,744	792	17.3
1901–1905	215,844	4,677	21.7
1906	47,319	964	20.4
1907	48,319	964	20.0
1908*	24,803	503	20.3
Year Ending June 30			
1909	50,895	925	18.2
1910	52,182	1,030	19.7
1906–1910	223,519	4,386	19.6
1911	54,774	1,251	22.8
1912	57,367	1,057	18.4
1913	59,960	1,112	18.5
1914	62,600	1,330	21.3
1915	64,150	1,163	18.1
1911–1915	298,851	5,913	19.8

Table No. 3

MORTALITY FROM ALL CAUSES IN HAWAII
By Administrative Divisions
July 1, 1908–June 30, 1913

	Aggregate Population	Deaths	Rate per 1,000 Pop.
Hawaii County	280,500	4,325	15.4
Honolulu City	266,000	5,375	20.2
Honolulu County†	153,150	1,523	9.9
Kauai County	121,000	1,355	11.2
Maui County	150,100	2,459	16.4
Kalawao County‡	3,800	354	93.2
Total	974,550	15,391	15.8
Honolulu City and County	419,150	6,898	16.5

Table No. 4

MORTALITY FROM THE MOST PREVALENT DISEASES IN HAWAII
July 1, 1909–June 30, 1913

Disease	Deaths	Rate per 10,000 Pop.	Per Cent.
Pneumonia	1,518	19.3	12.1
Tuberculosis	1,416	18.0	11.3
Gastro-enteritis	692	8.8	5.5
Valv. disease of heart	461	5.9	3.7
Bronchitis	403	5.1	3.2
Bright's disease	373	4.7	3.0
Meningitis	354	4.5	2.8
Cancer	324	4.1	2.6
Typhoid fever	277	3.5	2.2
Enteritis	275	3.5	2.2
Infantile marasmus	254	3.2	2.0
Convulsions	240	3.1	1.9
Leprosy	213	2.7	1.7
All other causes	5,740	73.1	45.8
All causes	12,540	159.5	100.0

Table No. 5

MORTALITY FROM TUBERCULOSIS IN HAWAII
By Administrative Divisions
July 1, 1908–June 30, 1913

	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaii County	280,500	364	13.0
Honolulu City	266,000	849	31.9
Honolulu County†	153,150	124	8.1
Kauai County	121,100	179	14.8
Maui County	150,100	242	16.1
Kalawao County	3,800	3	7.9
Total	974,550	1,761	18.1
Honolulu City and County	419,150	973	23.2

Table No. 6

MORTALITY FROM TUBERCULOSIS IN HAWAII
1900–1915

Calendar Year	Population	Deaths	Rate per 10,000 Pop.
1900	154,001	249§	16.2§
1901	157,790	328	20.8
1902	161,581	276	17.1
1903	165,372	309	18.7
1904	169,163	366	21.6
1900–1904	807,907	1,528	18.9

*January to June only. †Except the city of Honolulu. ‡Leper settlement of Molokai.
§The returns from the county of Hawaii are probably incomplete for this year.

Table No. 6—Continued

Calendar Year	Population	Deaths	Rate per 10,000 Pop.
1905	172,954	302	17.5
1906	176,745	367	20.8
1907	180,536	341	18.9
1908*	92,162	185	20.1
Year Ending June 30			
1909	187,328	345	18.4
1905–1909	809,725	1,540	19.0
1910	191,119	330	17.3
1911	196,714	382	19.4
1912	204,826	363	17.7
1913	213,438	341	16.0
1914	222,567	411	18.5
1910–1914	1,028,664	1,827	18.0
1915	229,300	349	15.2

Table No. 7

MORTALITY FROM TYPHOID FEVER IN HAWAII

By Administrative Divisions

July 1, 1908–June 30, 1913

	Population	Deaths	Rate per 10,000 Pop.
Hawaii County	280,500	198	7.1
Honolulu City	266,000	82	3.1
Honolulu County†	153,150	57	3.7
Kauai County	121,000	43	3.6
Maui County	150,100	46	3.1
Kalawao County	3,800	..	0.0
Total	974,550	426	4.4
Honolulu City and County	419,150	139	3.3

Table No. 8

MORTALITY FROM TYPHOID FEVER IN HAWAII

1900–1915

Calendar Year	Population	Deaths	Rate per 10,000 Pop.
1900	154,001	198	12.9
1901	157,790	106	6.7
1902	161,581	91	5.6
1903	165,372	144	8.7
1904	169,163	174	10.3
1900–1904	807,907	713	8.8

Table No. 8—Continued

Calendar Year	Population	Deaths	Rate per 10,000 Pop.
1905	172,954	125	7.2
1906	176,745	75	4.2
1907	180,536	125	6.9
1908*	92,162	54	5.9
Year Ending June 30			
1909	187,328	149	8.0
1905–1909	809,725	528	6.5
1910	191,119	111	5.8
1911	196,714	76	3.9
1912	204,826	39	1.9
1913	213,438	51	2.4
1914	222,567	56	2.5
1910–1914	1,028,664	333	3.2
1915	229,300	42	1.8

Table No. 9

MORTALITY FROM LEPROSY IN HAWAII

1902–1915

Year Ending June 30	Population	Deaths	Rate per 10,000 Pop.
1902	160,078	80	5.0
1903	163,917	46	2.8
1904	167,756	56	3.3
1905	171,595	64	3.7
1906	175,434	58	3.3
1902–1906	838,780	304	3.6
1907	179,273	56	3.1
1908	183,112	41	2.2
1909	186,951	45	2.4
1910	191,119	68	3.6
1911	196,714	47	2.4
1907–1911	937,169	257	2.7
1912	204,826	50	2.4
1913	213,438	48	2.2
1914	222,567	59	2.7
1915	229,300	39	1.7
1912–1915	870,131	196	2.3

*January to June only. †Except the city of Honolulu.

Table No. 10

STATISTICS OF THE LEPER SETTLEMENT AT MOLOKAI, HAWAII

1866–1915

Calendar Year	Population of Hawaii	Admissions to Molokai	Deaths from All Causes	Number of Lepers in Molokai, December 31	Lepers per 1,000 Population of Hawaii
1866*	62,959	141	36	115	1.83
1867	61,949	91	24	170	2.74
1868	60,939	131	27	267	4.38
1869	59,929	190	59	392	6.54
1866–1869	245,776	553	146	944	3.84
1870	58,919	57	57	392	6.65
1871	57,909	178	52	518	8.95
1872	56,897	91	63	546	9.60
1873	57,078	415	142	810	14.19
1874	57,259	78	141	731	12.77
1870–1874	288,062	819	455	2,997	10.40
1875	57,440	178	149	754	13.13
1876	57,621	75	119	704	12.22
1877	57,803	122	129	694	12.01
1878	57,985	209	111	792	13.66
1879	61,750	92	194	688	11.14
1875–1879	292,599	676	702	3,632	12.41
1880	65,515	51	151	589	8.99
1881	69,280	195	129	654	9.44
1882	73,046	70	111	613	8.39
1883	76,812	300	150	763	9.93
1884	80,578	108	167	702	8.71
1880–1884	365,231	724	708	3,321	9.09
1885	82,146	103	142	663	8.07
1886	83,715	43	101	600	7.17
1887	85,284	220	111	708	8.30
1888	86,853	571	236	1,033	11.89
1889	88,422	307	149	1,187	13.42
1885–1889	426,420	1,244	739	4,191	9.83

*Settlement established January 6, 1866.

Table No. 10—Continued

Calendar Year	Population of Hawaii	Admissions to Molokai	Deaths from All Causes	Number of Lepers in Molokai, December 31	Lepers per 1,000 Population of Hawaii
1890	89,990	185	158	1,213	13.48
1891	93,161	141	210	1,142	12.26
1892	96,333	105	152	1,095	11.37
1893	99,504	209	151	1,153	11.59
1894	102,675	129	159	1,123	10.94
1890–1894	481,663	769	830	5,726	11.89
1895	105,846	105	141	1,087	10.27
1896	109,020	142	114	1,115	10.23
1897	120,265	124	140	1,099	9.14
1898	131,510	75	114	1,059	8.05
1899	142,755	61	104	1,014	7.10
1895–1899	609,396	507	613	5,374	8.82
1900	154,001	109	134	983	6.38
1901	157,790	94	172	900	5.70
1902	161,581	80	106	874	5.41
1903	165,372	114	101	872	5.27
1904	169,163	92	107	856	5.06
1900–1904	807,907	489	620	4,485	5.55
1905	172,954	95	95	854	4.94
1906	176,745	64	84	834	4.72
1907	180,536	78	88	809	4.48
1908	184,327	32	59	771	4.18
1909*	191,119	47*	124*	614	3.21
1905–1909	905,681	316	450	3,882	4.29
Year ending June 30				Remaining June 30	
1911	200,520	40	61	592	2.95
1912	209,132	91	64	622	2.97
1913	217,744	113	49	683	3.14
1914	227,391	67	75	666	2.93
1915	231,210	49	62	638	2.76
1911–1915	1,085,997	360	311	3,201	2.95

Source: For 1866-1908, Report of the Board of Health of Hawaii, 1909, p. 186; for subsequent years, see Annual Reports of the Territorial Board of Health.

*Eighteen months, January 1, 1909, to June 30, 1910.

Table No. 11

MORTALITY FROM PLAGUE IN HAWAII
1902–1915

Year Ending June 30	Population	Deaths	Rate per 10,000 Pop.
1902	160,078	37	2.3
1903	163,917	36	2.2
1904	167,756	10	0.6
1905	171,595	13	0.8
1906	175,434	28	1.6
1902–1906	838,780	124	1.5
1907	179,273	32	1.8
1908	183,112	7	0.4
1909	186,951	0	0.0
1910	191,119	11	0.6
1911	196,714	6	0.3
1907–1911	937,169	56	0.6
1912	204,826	6	0.3
1913	213,438	8	0.4
1914	222,567	3	0.1
1915	229,300	1	0.04
1912–1915	870,131	18	0.2

Table No. 12

MORTALITY FROM BERIBERI IN HAWAII
1902–1915

Year Ending June 30	Population	Deaths	Rate per 10,000 Pop.
1902	160,078	59	3.7
1903	163,917	36	2.2
1904	167,756	43	2.6
1905	171,595	27	1.6
1906	175,434	35	2.0
1902–1906	838,780	200	2.4
1907	179,273	24	1.3
1908	183,112	31	1.7
1909	186,951	57	3.0
1910	191,119	33	1.7
1911	196,714	26	1.3
1907–1911	937,169	171	1.8
1912	204,826	22	1.1
1913	213,438	35	1.6
1914	222,567	49	2.2
1915	229,300	42	1.8
1912–1915	870,131	148	1.7

Table No. 13

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913

Race	Aggregate Years of Life	Deaths	Crude Rate per 1,000	Factor for Correction	Standardized Death Rate per 1,000
Hawaiian	132,246	4,891	36.98	0.9305	34.41
Part Hawaiian	63,560	789	12.41	1.0920	13.55
Chinese	110,075	1,167	10.60	1.0823	11.47
Japanese	404,633	4,912	12.14	1.3683	16.61
Portuguese	113,242	1,599	14.12	1.0414	14.70
All others	150,794	2,033	13.48	....	....
All Races	974,550	15,391	15.79	1.1699	18.47

NOTE.—Standardized on the basis of the age and sex constitution of the population of England and Wales, 1911, by the indirect method of the Registrar-General of England and Wales. The direct method can not be used here, as the Hawaiian statistics do not specify the deaths by race according to age and sex.

Table No. 14

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913
ALL RACES

Age	Deaths in England and Wales, 1911, per 1,000,000 Living at Each Group of Ages		All Races of Hawaii Aggregate Years of Life 1908-1913		Calculated Number of Deaths in Hawaii 1908-1913	
	Males	Females	Males	Females	Males	Females
Under 5	47,318	40,143	61,820	60,428	2,925	2,426
5– 9	3,461	3,374	48,944	47,808	169	161
10–14	2,040	2,070	36,129	32,676	74	68
15–19	3,036	2,725	39,942	29,391	121	80
20–24	3,851	3,209	69,134	32,851	266	105
25–29	4,456	3,735	68,321	35,542	304	133
30–34	5,526	4,563	76,572	32,781	423	150
35–39	7,112	5,903	72,384	27,469	515	162
40–44	9,268	7,413	53,819	17,369	499	129
45–49	12,490	9,859	38,255	11,812	478	116
50–54	17,407	13,236	23,565	8,073	410	107
55–59	24,563	19,093	13,439	4,858	330	93
60–64	36,074	27,734	11,626	3,075	419	85
65–69	52,091	39,468	5,438	2,202	283	87
70–74	80,900	66,717	2,875	1,433	233	96
75–79	119,645	99,528	1,500	909	179	90
80–84	171,994	151,578	625	437	107	66
85 and over	270,692	232,681	688	360	186	84
All ages	.....	.....	625,076	349,474	7,921	4,238
Total			974,550		12,159	

	Actual Number of Deaths	Crude Death Rate per 1,000	Calculated Number of Deaths	Index Death Rate	Death Rate England and Wales 1911	Factor for Correction	All Races: Standardized Death Rate
Males	9,163	14.66	7,921	12.67	15.58	1.2297	18.03
Females	6,228	17.82	4,238	12.13	13.67	1.1270	20.08
Total	15,391	15.79	12,159	12.48	14.60	1.1699	18.47

Table No. 15

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913
HAWAIIANS

Age	Deaths in England and Wales, 1911, per 1,000,000 Living at Each Group of Ages		Hawaiian Population Aggregate Years of Life 1908-1913		Calculated Number of Deaths Among Hawaiian Population 1908-1913	
	Males	Females	Males	Females	Males	Females
Under 5	47,318	40,143	6,952	6,838	329	274
5– 9	3,461	3,374	6,365	6,384	22	22
10–14	2,040	2,070	6,638	6,211	14	13
15–19	3,036	2,725	6,822	6,678	21	18
20–24	3,851	3,209	5,730	5,788	22	19
25–29	4,456	3,735	5,703	5,545	25	21
30–34	5,526	4,563	4,250	4,815	23	22
35–39	7,112	5,903	5,294	5,116	38	30
40–44	9,268	7,413	3,725	3,733	35	28
45–49	12,490	9,859	4,270	3,733	53	37
50–54	17,407	13,236	3,240	3,073	56	41
55–59	24,563	19,093	3,104	2,228	76	43
60–64	36,074	27,734	2,067	1,242	75	34
65–69	52,091	39,468	1,371	948	71	37
70–74	80,900	66,717	1,023	698	83	47
75–79	119,645	99,528	757	448	91	45
80–84	171,994	151,578	409	294	70	45
85 and over	270,692	232,681	498	256	135	60
All ages	.....	.....	68,218	64,028	1,239	836
Total			132,246		2,075	

	Actual Number of Deaths	Crude Death Rate per 1,000	Calculated Number of Deaths	Index Death Rate	Death Rate England and Wales 1911	Factor for Correction	Hawaiians: Standardized Death Rate
Males	2,571	37.69	1,239	18.16	15.58	0.8579	32.33
Females	2,320	36.23	836	13.06	13.67	1.0467	37.92
Total	4,891	36.98	2,075	15.69	14.60	0.9305	34.41

Table No. 16

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913
CHINESE

Age	Deaths in England and Wales, 1911, per 1,000,000 Living at Each Group of Ages		Chinese Population Aggregate Years of Life 1908-1913		Calculated Number of Deaths Among Chinese Population 1908-1913	
	Males	Females	Males	Females	Males	Females
Under 5	47,318	40,143	4,363	3,857	206	155
5– 9	3,461	3,374	5,077	4,563	18	15
10–14	2,040	2,070	4,345	3,887	9	8
15–19	3,036	2,725	3,300	2,286	10	6
20–24	3,851	3,209	2,055	1,495	8	5
25–29	4,456	3,735	4,014	1,672	18	6
30–34	5,526	4,563	9,282	1,366	51	6
35–39	7,112	5,903	13,784	1,433	98	8
40–44	9,268	7,413	11,677	934	108	7
45–49	12,490	9,859	10,362	596	129	6
50–54	17,407	13,236	7,105	437	124	6
55–59	24,563	19,093	4,424	214	109	4
60–64	36,074	27,734	4,432	113	160	3
65–69	52,091	39,468	1,872	76	98	3
70–74	80,900	66,717	775	41	63	3
75–79	119,645	99,528	148	16	18	2
80–84	171,994	151,578	35	9	6	1
85 and over	270,692	232,681	26	4	7	1
All ages	.....	.....	87,076	22,999	1,240	245
Total			110,075		1,485	

	Actual Number of Deaths	Crude Death Rate per 1,000	Calculated Number of Deaths	Index Death Rate	Death Rate England and Wales 1911	Factor for Correction	Chinese: Standardized Death Rate
Males	950	10.91	1,240	14.24	15.58	1.0941	11.94
Females	217	9.44	245	10.65	13.67	1.2836	12.12
Total	1,167	10.60	1,485	13.49	14.60	1.0823	11.47

Table No. 17

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913
JAPANESE

Age	Deaths in England and Wales, 1911, per 1,000,000 Living at Each Group of Ages		Japanese Population Aggregate Years of Life 1908-1913		Calculated Number of Deaths Among Japanese Population 1908-1913	
	Males	Females	Males	Females	Males	Females
Under 5	47,318	40,143	25,125	24,660	1,189	990
5– 9	3,461	3,374	17,946	17,228	62	58
10–14	2,040	2,070	8,403	7,331	17	15
15–19	3,036	2,725	8,848	4,778	27	13
20–24	3,851	3,209	39,148	12,476	151	40
25–29	4,456	3,735	37,868	16,748	169	63
30–34	5,526	4,563	45,547	17,961	252	82
35–39	7,112	5,903	39,370	13,209	280	78
40–44	9,268	7,413	28,742	7,356	266	55
45–49	12,490	9,859	15,720	3,211	196	32
50–54	17,407	13,236	7,651	1,037	133	14
55–59	24,563	19,093	2,142	278	53	5
60–64	36,074	27,734	1,391	106	50	3
65–69	52,091	39,468	268	15	14	1
70–74	80,900	66,717	36	0	3	0
75–79	119,645	99,528	14	0	2	0
80–84	171,994	151,578	5	5	1	1
85 and over	270,692	232,681	10	0	3	0
All ages	.....	.....	278,234	126,399	2,868	1,450
Total			404,633		4,318	

	Actual Number of Deaths	Crude Death Rate per 1,000	Calculated Number of Deaths	Index Death Rate	Death Rate England and Wales 1911	Factor for Correction	Japanese: Standardized Death Rate
Males	2,926	10.52	2,868	10.31	15.58	1.5112	15.90
Females	1,986	15.71	1,450	11.47	13.67	1.1918	18.72
Total	4,912	12.14	4,318	10.67	14.60	1.3683	16.61

Table No. 18

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913
PORTUGUESE

Age	Deaths in England and Wales, 1911, per 1,000,000 Living at Each Group of Ages		Portuguese Population Aggregate Years of Life 1908-1913		Calculated Number of Deaths Among Portuguese Population, 1908-1913	
	Males	Females	Males	Females	Males	Females
Under 5	47,318	40,143	9,920	10,100	469	405
5– 9	3,461	3,374	8,221	8,177	28	28
10–14	2,040	2,070	7,146	6,821	15	14
15–19	3,036	2,725	7,134	6,761	22	18
20–24	3,851	3,209	5,653	5,355	22	17
25–29	4,456	3,735	4,349	4,336	19	16
30–34	5,526	4,563	3,503	2,822	19	13
35–39	7,112	5,903	2,979	2,462	21	15
40–44	9,268	7,413	1,863	1,610	17	12
45–49	12,490	9,859	1,910	1,645	24	16
50–54	17,407	13,236	1,546	1,509	27	20
55–59	24,563	19,093	1,316	1,035	32	20
60–64	36,074	27,734	1,692	839	61	23
65–69	52,091	39,468	787	458	41	18
70–74	80,900	66,717	429	283	35	19
75–79	119,645	99,528	229	174	27	17
80–84	171,994	151,578	29	49	5	7
85 and over	270,692	232,681	59	41	16	10
All ages	.....	.....	58,765	54,477	900	688
Total			113,242		1,588	

	Actual Number of Deaths	Crude Death Rate per 1,000	Calculated Number of Deaths	Index Death Rate	Death Rate England and Wales 1911	Factor for Correction	Portuguese: Standardized Death Rate
Males	915	15.57	900	15.32	15.58	1.0170	15.83
Females	684	12.56	688	12.63	13.67	1.0823	13.59
Total	1,599	14.12	1,588	14.02	14.60	1.0414	14.70

Table No. 19

MORTALITY FROM ALL CAUSES IN HAWAII, BY RACE
STANDARDIZED FOR AGE AND SEX CONSTITUTION OF THE POPULATION
July 1, 1908–June 30, 1913
PART HAWAIIAN

Age	Deaths in England and Wales, 1911, per 1,000,000 Living at Each Group of Ages		Part Hawaiian Population Aggregate Years of Life. 1908-1913		Calculated Number of Deaths Among Part Hawaiian Population, 1908-1913	
	Males	Females	Males	Females	Males	Females
Under 5	47,318	40,143	7,056	6,825	334	274
5– 9	3,461	3,374	5,611	5,352	19	18
10–14	2,040	2,070	4,708	4,213	10	9
15–19	3,036	2,725	4,009	4,149	12	11
20–24	3,851	3,209	2,713	3,389	10	11
25–29	4,456	3,735	2,110	2,489	9	9
30–34	5,526	4,563	1,449	1,418	8	6
35–39	7,112	5,903	1,328	1,434	9	8
40–44	9,268	7,413	769	772	7	6
45–49	12,490	9,859	813	645	10	6
50–54	17,407	13,236	518	575	9	8
55–59	24,563	19,093	402	234	10	4
60–64	36,074	27,734	81	112	3	3
65–69	52,091	39,468	122	71	6	3
70–74	80,900	66,717	30	76	2	5
75–79	119,645	99,528	41	31	5	3
80–84	171,994	151,578	5	0	1	0
85 and over	270,692	232,681	5	5	1	1
All ages	.....	.....	31,770	31,790	465	385
Total			63,560		850	

	Actual Number of Deaths	Crude Death Rate per 1,000	Calculated Number of Deaths	Index Death Rate	Death Rate England and Wales 1911	Factor for Correction	Part Hawaiian: Standardized Death Rate
Males	391	12.31	465	14.64	15.58	1.0642	13.10
Females	398	12.52	385	12.11	13.67	1.1288	14.13
Total	789	12.41	850	13.37	14.60	1.0920	13.55

Table No. 20

MORTALITY FROM TUBERCULOSIS IN HAWAII, BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	281	51.7
Part Hawaiian	26,131	46	17.6
Portuguese	46,571	27	5.8
Chinese	45,268	57	12.6
Japanese	166,404	199	12.0
All others	62,020	94	15.2
Total	400,780	704	17.6

Table No. 21

MORTALITY FROM PNEUMONIA IN HAWAII, BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	275	50.6
Part Hawaiian	26,131	55	21.0
Portuguese	46,571	81	17.4
Chinese	45,268	40	8.8
Japanese	166,404	241	14.5
All others	62,020	76	12.3
Total	400,780	768	19.2

Table No. 22

MORTALITY FROM ACUTE AND CHRONIC NEPHRITIS IN HAWAII, BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	93	17.1
Part Hawaiian	26,131	20	7.7
Portuguese	46,571	21	4.5
Chinese	45,268	42	9.3
Japanese	166,404	65	3.9
All others	62,020	33	5.3
Total	400,780	274	6.8

Table No. 23

MORTALITY FROM VALVULAR DISEASE OF THE HEART IN HAWAII, BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	113	20.8
Part Hawaiian	26,131	3	1.1
Portuguese	46,571	22	4.7
Chinese	45,268	25	5.5
Japanese	166,404	33	2.0
All others	62,020	50	8.1
Total	400,780	246	6.1

Table No. 24

MORTALITY FROM CANCER IN HAWAII BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	51	9.4
Part Hawaiian	26,131	7	2.7
Portuguese	46,571	27	5.8
Chinese	45,268	12	2.7
Japanese	166,404	33	2.0
All others	62,020	23	3.7
Total	400,780	153	3.8

Table No. 25

PROPORTIONATE MORTALITY FROM CANCER IN HAWAII BY ORGANS AND PARTS, ACCORDING TO RACE
July 1, 1911–June 30, 1913

Organ	Hawaiians		Portuguese		Chinese		Japanese	
	Deaths	Per Cent.	Deaths	Per Cent.	Deaths	Per Cent.	Deaths	Per Cent.
Breast	7	13.7	1	3.7	..	0.0	..	0.0
Face	..	0.0	..	0.0	1	8.3	..	0.0
Intestines	1	2.0	..	0.0	..	0.0	4	12.1
Liver	5	9.8	4	14.8	1	8.3	1	3.0
Stomach	14	27.5	11	40.8	6	50.0	19	57.6
Uterus	15	29.4	2	7.4	2	16.7	6	18.2
Other organs	9	17.6	9	33.3	2	16.7	3	9.1
All organs	51	100.0	27	100.0	12	100.0	33	100.0

Table No. 26

MORTALITY FROM LEPROSY IN HAWAII BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	83	15.3
Part Hawaiian	26,131	3	1.1
Portuguese	46,571	2	0.4
Chinese	45,268	7	1.5
Japanese	166,404	2	0.1
All others	62,020	1	0.2
Total	400,780	98	2.4

Table No. 27

MORTALITY FROM ARTERIO-SCLEROSIS IN HAWAII, BY RACE
July 1, 1911–June 30, 1913

Race	Aggregate Population	Deaths	Rate per 10,000 Pop.
Hawaiian	54,386	29	5.3
Part Hawaiian	26,131	2	0.8
Portuguese	46,571	9	1.9
Chinese	45,268	8	1.8
Japanese	166,404	0	0.0
All others	62,020	10	1.6
Total	400,780	58	1.4

Table No. 28

MORTALITY FROM ALL CAUSES IN HAWAII BY AGE AND RACE
July 1, 1911–June 30, 1914

Age	Hawaiians			
	Aggregate Population	Deaths from All Causes	Rate per 1,000 Pop.	
Under 1 year	1,724	597	346.3	
1–4 years	6,122	189	30.9	
Under 5 years	7,846	786	100.2	
5– 9 years	7,259	45	6.2	
10–19 "	15,008	237	15.8	
20–29 "	12,960	319	24.6	
30–39 "	11,092	283	25.5	
40–49 "	8,803	279	31.7	
50–59 "	6,627	282	42.6	
60–69 "	3,208	234	72.9	
70 and over	2,500	374	149.6	
All ages	75,303	2,839	37.7	

Table No. 29

MORTALITY FROM ALL CAUSES IN HAWAII BY AGE AND RACE
July 1, 1911–June 30, 1914

PART HAWAIIANS

Age	Aggregate Population	Deaths from All Causes	Rate per 1,000 Pop.
Under 1 year	2,067	260	125.8
1–4 years	6,889	66	9.6
Under 5 years	8,956	326	36.4
5– 9 years	7,073	19	2.7
10–19 "	11,018	47	4.3
20–29 "	6,905	61	8.8
30–39 "	3,629	33	9.1
40–49 "	1,935	32	16.5
50–59 "	1,115	31	27.8
60–69 "	250	19	76.0
70 and over	123	12	97.6
All ages	41,004	580	14.1

Table No. 30

MORTALITY FROM ALL CAUSES IN HAWAII BY AGE AND RACE
July 1, 1911–June 30, 1914

PORTUGUESE

Age	Aggregate Population	Deaths from All Causes	Rate per 1,000 Pop.
Under 1 year	2,881	423	146.8
1–4 years	9,573	152	15.9
Under 5 years	12,454	575	46.2
5– 9 years	10,200	35	3.4
10–19 "	17,329	33	1.9
20–29 "	12,250	69	5.6
30–39 "	7,319	45	6.1
40–49 "	4,382	38	8.7
50–59 "	3,360	65	19.3
60–69 "	2,346	82	35.0
70 and over	803	77	95.9
All ages	70,443	1,019	14.5

Table No. 31

MORTALITY FROM ALL CAUSES IN HAWAII BY AGE AND RACE
July 1, 1911–June 30, 1914

JAPANESE

Age	Aggregate Population	Deaths from All Causes	Rate per 1,000 Pop.
Under 1 year	7,310	1,366	186.9
1–4 years	23,827	333	14.0
Under 5 years	31,137	1,699	54.6
5– 9 years	21,981	107	4.9
10–19 "	18,364	96	5.2
20–29 "	66,423	346	5.2
30–39 "	72,545	447	6.2
40–49 "	34,401	358	10.4
50–59 "	6,956	161	23.1
60–69 "	1,113	33	29.6
70 and over	25	3	120.0
All ages	252,945	3,250	12.8

Table No. 32

MORTALITY FROM ALL CAUSES IN HAWAII BY AGE AND RACE
July 1, 1911–June 30, 1914

CHINESE

Age	Aggregate Population	Deaths from All Causes	Rate per 1,000 Pop.
Under 1 year	948	157	165.6
1–4 years	3,674	43	11.7
Under 5 years	4,622	200	43.3
5– 9 years	5,422	15	2.8
10–19 "	7,775	29	3.7
20–29 "	5,198	24	4.6
30–39 "	14,559	67	4.6
40–49 "	13,270	111	8.4
50–59 "	6,858	100	14.6
60–69 "	3,655	96	26.3
70 and over	594	60	101.0
All ages	61,953	702	11.3

Table No. 33

BIRTHS IN HAWAII, BY RACE
July 1, 1908–June 30, 1913

Race	Aggregate Population	Births	Birth Rate per 1,000 Population	Female Population 15-49 Years of Age	Birth Rate per 1,000 Female Population 15-49 Years of Age
Hawaiian	132,246	3,130	23.7	35,408	88.4
Part Hawaiian	63,560	2,062	32.4	14,296	144.2
Chinese	110,075	2,221	20.2	9,782	227.0
Japanese	404,633	10,103	25.0	75,739	133.4
Portuguese	113,242	3,668	32.4	24,991	146.8
All others	150,794	3,268	21.7	26,999	121.0
All races	974,550	24,452	25.1	187,215	130.6
Hawaiian and Part Hawaiian	195,806	5,192	26.5	49,704	104.5

NOTE.—The birth rate for pure Hawaiians is probably too low and for part Hawaiians too high, as some part Hawaiian children have Hawaiian mothers. Hawaiians and part Hawaiians combined, however, would give almost a true birth rate, since men of the Hawaiian race rarely marry Caucasian or Mongolian women. For comparison it may be stated that the birth rate of England and Wales per 1,000 women 15-49 years of age was 88.2 in 1911.

Table No. 34

INFANTILE MORTALITY IN HAWAII, BY NATIVITY
July 1, 1911–June 30, 1913

Nativity	Births	Deaths under 1 Year of Age	Deaths Per Cent. of Births
Filipino	130	97	74.6
Hawaiian	1,223	416	34.0
Other Nationalities	155	41	26.5
Japanese	4,251	775	18.2
Portuguese	1,595	276	17.3
Spanish	291	41	14.1
Part Hawaiian	1,252	170	13.6
Porto Rican	439	52	11.8
Chinese	933	108	11.6
German	56	5	8.9
American	298	19	6.4
British	92	4	4.3
Total	10,715	2,004	18.7

Table No. 35

MORBIDITY, DISCHARGES AND MORTALITY OF THE U. S. ARMY IN HAWAII
1904-1914

Year	Mean Strength	Admissions to Sick Report: Number	Admissions to Sick Report: Rate per 1,000 Men	Discharges: Number	Discharges: Rate per 1,000 Men	Deaths: Number	Deaths: Rate per 1,000 Men
1904.....	204	294	1441.2	..	..	2	9.8
1905.....	176	176	1000.0	1	5.7	..	..
1906.....	232	234	1008.6	5	21.6	2	8.6
1907.....	192	185	963.5	2	10.4	..	..
1908.....	255	327	1282.4	11	43.1	2	7.8
1909.....	1,014	1,197	1180.5	15	14.8	2	2.0
1910.....	1,220	1,232	1009.8	21	17.2	3	2.5
1911.....	2,014	2,176	1080.4	28	13.9	6	3.0
1912.....	3,376	3,161	936.3	61	18.1	13	3.9
1913.....	6,130	4,301	701.6	63	10.3	23	3.8
1904–1913....	14,813	13,283	896.7	207	14.0	53	3.6
1914.....	8,268	4,329	523.6	72	9.0	15	1.8

Table No. 36

MORBIDITY, DISCHARGES AND MORTALITY OF THE U. S. ARMY IN HAWAII BY PRINCIPAL DISEASES AND INJURIES, 1904-1913
(Aggregate Mean Strength, 14,813)

Diseases	Admissions to Sick Report: Number	Admissions to Sick Report: Rate per 1,000 Men	Discharges: Number	Discharges: Rate per 1,000 Men	Deaths: Number	Deaths: Rate per 1,000 Men
Epidemic diseases.....	707	47.7	..	..	3	0.2
Other general diseases.....	2,585	174.5	62	4.2	11	0.7
Nervous diseases.....	563	38.0	67	4.5	3	0.2
Circulatory diseases.....	392	26.5	18	1.2	1	0.1
Respiratory diseases.....	940	63.5	7	0.5	1	0.1
Digestive diseases.....	2,154	145.4	6	0.4	4	0.3
Genito-urinary diseases.....	214	14.4	12	0.8	2	0.1
Skin and cellular tissue.....	1,682	113.5	2	0.1	..	..
Organs of locomotion.....	484	32.7	16	1.1	..	..
External causes.....	3,415	230.5	13	0.9	27	1.8
Malformation.....	30	2.0	4	0.3	..	..
Ill-defined.....	117	7.9	..	..	1	0.1
All diseases.....	9,868	686.2	194	13.1	26	1.8
External causes.....	3,415	230.5	13	0.9	27	1.8
All causes.....	13,283	896.7	207	14.0	53	3.6

Table No. 37

MORBIDITY, DISCHARGES AND MORTALITY OF THE U. S. ARMY IN HAWAII
(Classification of Diseases and Injuries in Detail)
1904–1913

Diseases	Admissions to Sick Report: No.	Admissions to Sick Report: Rate per 1,000 Men	Discharges: No.	Discharges: Rate per 1,000 Men	Deaths: No.	Deaths: Rate per 1,000 Men
Typhoid fever.....	15	1.0	..	..	3	0.2
Malaria.....	97	6.5	..	..	..	..
Undetermined fevers.....	36	2.4	..	..	..	..
Measles.....	76	5.1	..	..	..	..
Scarlet fever.....	..	..	..	..	..	..
Diphtheria.....	4	0.3	..	..	..	..
Other eruptive fevers.....	3	0.2	..	..	..	..
Influenza.....	304	20.5	..	..	..	..
Cholera nostras.....	2	0.1	..	..	..	..
Amebic dysentery.....	14	0.9	..	..	..	..
Other unclassified dysentery.	15	1.0	..	..	..	..
Erysipelas.....	1	0.1	..	..	..	..
Dengue.....	28	1.9	..	..	..	..
Mumps.....	102	6.9	..	..	..	..
Other epidemic diseases.....	10	0.7	..	..	..	..
Vaccinia.....	12	0.8	..	..	..	..
Tuberculosis of the lungs....	41	2.8	20	1.4	6	0.4
Tuberculosis of other organs.	7	0.5	3	0.2	..	..
Syphilis and its results.....	519	35.0	20	1.4	3	0.2
Soft chancre.....	253	17.1	..	..	..	..
Gonorrhea.....	1,197	80.8	8	0.5	..	..
Cancer.....	2	0.1	..	..	1	0.1
Benign tumors.....	48	3.2	..	..	..	..
Acute articular rheumatism..	38	2.6	1	0.1	..	..
Chronic articular rheumatism	35	2.4	1	0.1	..	..
Diabetes.....	1	0.1	..	..	..	..
Alcoholism.....	260	17.6	7	0.5	..	..
Other chronic poisonings....	10	0.7	..	..	..	..
Other general diseases.....	162	10.9	2	0.1	1	0.1
Encephalitis.....	1	0.1	..	..	1	0.1
Epidemic cerebrospinal meningitis.....	1	0.1	..	..	..	..
Other diseases of spinal cord.	2	0.1	1	0.1	..	..
Tetanus.....	1	0.1	..	..	1	0.1
Apoplexy.....	1	0.1	..	..	1	0.1
Paralysis.....	5	0.3	..	..	..	..
Epilepsy.....	14	0.9	4	0.3	..	..
Mental alienation.....	53	3.6	39	2.6	..	..
Neuralgia and neuritis.....	44	3.0	2	0.1	..	..
Trachoma.....	3	0.2	2	0.1	..	..
Conjunctivitis.....	22	1.5	..	..	..	..
Other diseases of the eye....	185	12.5	6	0.4	..	..
Diseases of the ear.....	107	7.2	4	0.3	..	..

Table No. 37—Continued

Diseases	Admissions to Sick Report: No.	Admissions to Sick Report: Rate per 1,000 Men	Discharges: No.	Discharges: Rate per 1,000 Men	Deaths: No.	Deaths: Rate per 1,000 Men
Other nervous diseases	124	8.4	9	0.6	..	..
Pericarditis	2	0.1	..	..	..	..
Acute endocarditis	1	0.1	..	..	1	0.1
Organic diseases of the heart	38	2.6	10	0.7	..	..
Functional diseases of the heart	10	0.7	2	0.1	..	..
Diseases of arteries	1	0.1	1	0.1	..	..
Varicose veins	4	0.3	..	..	..	..
Varicocele	41	2.8	2	0.1	..	..
Haemorrhoids	65	4.4	..	..	..	..
Diseases of the lymphatic system	52	3.5	..	..	..	..
Other circulatory diseases	178	12.0	3	0.2	..	..
Diseases of the nasal fossae	117	7.9	1	0.1	..	..
Diseases of the larynx	10	0.7	..	..	..	..
Diseases of the thyreoid body	2	0.1	..	..	..	..
Bronchitis	565	38.1	1	0.1	..	..
Broncho-pneumonia	3	0.2	..	..	..	..
Pneumonia	15	1.0	..	..	1	0.1
Pleurisy	17	1.1	1	0.1	..	..
Asthma	9	0.6	..	..	..	..
Haemoptysis	2	0.1	..	..	..	..
Other respiratory diseases	200	13.5	4	0.3	..	..
Diseases of the mouth and annexa	142	9.6	..	..	..	..
Diseases of the pharynx	388	26.2	..	..	..	..
Ulcer of the stomach	1	0.1	..	..	..	..
Diarrhea and enteritis	419	28.3	..	..	..	..
Ankylostomiasis	1	0.1	..	..	..	..
Intestinal parasites	22	1.5	..	..	..	..
Appendicitis	124	8.4	..	..	1	0.1
Hernia	51	3.4	3	0.2	1	0.1
Other diseases of the stomach	139	9.4	..	..	..	..
Diseases of the anus	11	0.7	..	..	..	..
Other diseases of the intestines	185	12.5	..	..	..	..
Cirrhosis of liver	2	0.1	..	..	1	0.1
Biliary calculi	2	0.1	..	..	..	..
Other diseases of the liver	35	2.4	..	..	..	..
Other digestive diseases	632	42.7	3	0.2	1	0.1
Acute nephritis	1	0.1	..	..	..	..
Bright's disease	11	0.7	2	0.1	1	0.1
Pyelitis and pyelonephritis	2	0.1	..	..	1	0.1
Other diseases of the kidneys	3	0.2	1	0.1	..	..
Diseases of the bladder	35	2.4	8	0.5	..	..
Diseases of the urethra	25	1.7	..	..	..	..

Table 37—Concluded

Diseases	Admissions to Sick Report: No.	Admissions to Sick Report: Rate per 1,000 Men	Discharges: No.	Discharges: Rate per 1,000 Men	Deaths: No.	Deaths: Rate per 1,000 Men
Diseases of the prostate	2	0.1	..	..	..	..
Diseases of the male genital organs	44	3.0	..	..	..	..
Other diseases of the genito-urinary system	91	6.1	1	0.1	..	..
Carbuncle and furuncle	414	27.9	..	..	..	..
Acute abscess	197	13.3	..	..	..	..
Tropical ulcer	2	0.1	..	..	..	..
Pemphigus contagiosus	1	0.1	..	..	..	..
Dhobie itch	15	1.0	..	..	..	..
Prickly heat	6	0.4	..	..	..	..
Other parasitic diseases of the skin	19	1.3	..	..	..	..
Other diseases of the skin	1,028	69.4	2	0.1	..	..
Diseases of the bones	34	2.3	..	..	..	..
Diseases of the joints	48	3.2	3	0.2	..	..
Other diseases of the organs of locomotion	388	26.2	9	0.6	..	..
Flat foot	14	0.9	4	0.3	..	..
Malformations	30	2.0	4	0.3	..	..
Suicide	1	0.1	..	..	1	0.1
Homicide	1	0.1	..	..	1	0.1
Poisoning, acute	103	7.0	..	..	4	0.3
Venomous bite	19	1.3	..	..	..	..
Burns	32	2.2	..	..	..	..
Wound by gunshot	34	2.3	3	0.2	5	0.3
Wound by cutting instrument	522	35.2	1	0.1	1	0.1
Fractures	75	5.1	2	0.1	2	0.1
Dislocations	21	1.4	..	..	..	..
Sprains and muscular strains	429	29.0	..	..	..	..
Traumatism by fall	641	43.3	1	0.1	1	0.1
Traumatism by machines	16	1.1	..	..	..	..
Traumatism by crushing	38	2.6	..	..	3	0.2
Injuries by animals	185	12.5	1	0.1	..	..
Effects of heat	48	3.2	..	..	..	..
Effects of electricity	1	0.1	..	..	..	..
Drowning	..	..	..	..	9	0.6
Other violence	1,249	84.3	5	0.3	..	..
Malingering	13	0.9	..	..	..	..
Under observation	22	1.5	..	..	1	0.1
Other ill-defined	82	5.5	..	..	..	..

Table No. 38

QUARTERLY TEMPERATURE IN THE TERRITORY OF HAWAII
1908–1912

ISLAND OF HAWAII *Eastern Coast Region*	Altitude Feet	January-March	April-June	July-September	October-December	Annual
Kohala Mill	270	68.8	71.5	74.5	72.1	71.7
Honokaa	470	69.0	72.1	74.2	71.7	71.8
Olaa Mill	210	70.1	71.7	74.2	72.4	72.1
Southern Coast Region						
Pahala	850	68.2	70.5	73.7	72.1	71.1
Western Coast Region						
Holualoa	1,350	65.6	67.6	69.9	68.5	67.9
Interior, North						
Waimea	2,720	60.1	62.6	64.7	63.0	62.6
Interior, South						
Volcano House	4,000	56.7	58.5	60.7	59.6	58.9
ISLAND OF MAUI						
Northern Coast Region						
Haiku	700	68.4	70.8	73.4	70.9	70.9
Wailuku	250	70.0	73.5	76.7	73.4	73.4
Western Coast Region						
Kaanapali	12	70.8	75.1	78.3	74.7	74.7
Interior, North						
Keanae Valley	1,000	64.9	67.2	69.9	67.4	67.4
ISLAND OF MOLOKAI						
Kalawao	70	70.3	73.5	76.4	73.5	73.4
ISLAND OF OAHU						
Northeastern Coast Region						
Maunawili Ranch	250	69.3	72.1	75.2	72.5	72.3
Ahuimanu	350	70.1	72.6	75.4	72.1	72.6
Northwestern Coast Region						
Waialua Mill	30	69.2	72.9	76.2	72.6	72.8
Waialua (Opaeula)	1,100	66.2	69.2	72.1	68.8	69.1
Western Coast Region						
Waianae	6	71.8	75.0	78.8	75.0	75.1
Waiawa	675	68.6	72.0	74.9	72.0	71.9
Southern Coast Region						
Honolulu, U. S. W. B	111	70.5	74.2	77.3	74.4	74.1
Schofield Barracks	990	66.2	69.8	73.2	69.7	69.7
Tantalus Heights	1,300	64.7	67.3	69.7	67.5	67.3
ISLAND OF KAUAI						
Eastern Coast Region						
Kealia	15	69.4	73.3	76.3	73.5	73.1
Lihue	200	68.5	72.6	75.9	72.0	72.2
Southern Coast Region						
Kokoa	241	69.8	73.2	76.2	73.5	73.2
Makaweli	140	71.3	74.4	77.1	74.5	74.3
Northern Coast Region						
Kilauea	342	69.1	72.5	75.4	72.4	72.3
Western Coast Region						
Mana Pump	30	70.0	73.9	76.9	72.7	73.4

Table No. 39

QUARTERLY RAINFALL (INCHES) IN THE TERRITORY OF HAWAII
1884-1915

ISLAND OF HAWAII *Eastern Coast Region (N. to S.)*	Altitude Feet	Years of Record	January-March	April-June	July-September	October-December	Annual
Kohala Mill	270	16	15.54	12.99	13.23	13.88	55.64
Honokaa	470	22	23.65	13.52	13.79	18.01	68.97
Ookala	400	21	35.38	23.58	23.74	31.39	114.09
Hilo	100	25	37.18	30.37	33.68	35.30	136.53
Olaa Mill	210	11	36.79	31.63	38.80	40.62	147.84
Kapoho	110	20	28.52	16.73	19.82	23.47	88.54
Southern Coast Region							
Pahala	850	20	14.77	4.81	6.94	11.55	38.07
Western Coast Region							
Holualoa	1,350	10	11.78	15.67	22.68	11.46	61.59
Interior, North							
Waimea	2,730	21	14.71	8.43	8.29	10.97	42.40
Interior, South							
Volcano House	4,000	13	24.57	16.31	17.16	20.67	78.71
ISLAND OF MAUI							
Northern Coast Region (E. to W.)							
Nahiku	700	11	47.28	39.51	44.90	46.62	178.31
Haiku	700	15	22.34	15.03	16.06	19.87	73.30
Wailuku	250	10	14.83	3.82	2.89	8.51	30.05
Western Coast Region							
Kaanapali	12	13	9.79	2.09	2.85	6.08	20.81
Interior, East							
Haleakala Ranch	2,000	20	20.61	5.90	6.26	14.24	47.01
Interior, North							
Keanae Valley	1,000	5	62.55	61.78	60.42	63.67	248.42
ISLAND OF MOLOKAI							
Molokai Ranch	800	12	15.84	4.56	3.33	10.72	34.45
ISLAND OF OAHU							
Northeastern Coast Region							
Maunawili Ranch	250	17	23.30	16.62	16.04	22.19	78.15
Ahuimanu	350	21	24.73	17.46	17.06	24.72	83.97
Kahuku	25	21	13.70	5.38	6.30	10.41	35.79
Northwestern Coast Region							
Waialua Mill	30	11	14.82	2.60	3.70	8.58	29.70
Waialua (Opaeula)	1,100	5	15.36	7.28	7.62	12.90	43.16
Western Coast Region							
Waianae	6	18	10.41	1.61	2.29	6.46	20.77
Waiawa	675	5	15.42	9.85	10.92	12.83	49.02
Ewa Plantage	50	21	9.50	2.23	1.97	7.08	20.78
Southern Coast Region							
Honolulu, U. S. Weather Bureau	111	19	10.96	5.86	4.21	9.99	31.02
Honolulu, Insane Asylum	30	20	14.28	6.15	6.36	11.46	38.25
Tantalus	1,360	10	27.04	22.58	27.47	28.76	105.85

Table No. 39—Continued

ISLAND OF KAUAI *Eastern Coast Region*	Altitude Feet	Years of Record	January-March	April-June	July-September	October-December	Annual
Kealia	15	13	15.22	5.85	6.04	11.57	38.68
Hanamaulu	200	18	15.98	6.98	7.63	13.35	43.94
Lihue (Grove Farm)	200	28	15.67	8.12	7.69	13.82	45.30
Lihue (Kilohana)	400	10	19.21	9.92	11.29	14.13	54.55
Lihue (Kukaua)	1,000	13	26.52	20.27	21.94	25.34	94.07
Southern Coast Region							
Koloa	241	26	19.14	12.93	13.49	16.93	62.49
West Lawai	225	11	14.95	5.61	8.05	10.29	38.90
Makaweli	140	17	10.87	2.12	2.53	6.50	22.02
Kekaha	40	21	10.67	2.20	2.60	6.36	21.83
Eleele	150	12	13.16	3.51	4.01	6.39	27.07
Northern Coast Region							
Kilanea	342	28	21.47	14.27	14.22	18.80	68.76
Western Coast Region							
Mana Pump	140	14	11.60	2.03	2.21	6.67	22.51
Interior of Island (South)							
Wahiawa Mountain	2,000	12	47.39	36.27	41.84	42.59	168.09

NOTE.—The data for Keanae Valley, Waialua (Opaeula) and Waiawa are for 1908-1912; for all other stations the data are for periods ending 1911.

Table No. 40

TEMPERATURE AND RAINFALL IN HONOLULU (U. S. W. B.)
1905-1915

Year	Temperature: Mean Annual	Mean Maximum	Mean Minimum	Rainfall	Number of Days on Which Rain Fell*
1905	73.3	78.5	68.1	16.99	187
1906	74.7	79.7	69.7	25.77	167
1907	75.0	79.9	70.1	30.13	159
1908	74.3	79.1	69.5	19.17	112
1909	73.6	78.5	68.7	20.81	167
1910	73.6	78.7	68.4	26.34	158
1911	74.0	78.9	69.1	26.71	163
1912	74.6	79.6	69.6	14.71	153
1913	75.0	80.1	69.8	18.53	150
1914	74.5	†	†	23.07	145
1915	75.0	†	†	29.64	154

*0.01 inch of rain or more. †Not available.

CHART I

ELEMENTS OF MORTALITY—HAWAII

MORTALITY FROM ALL CAUSES
1901-1915
(Rate per 1,000 of Population)

Year	Hawaii	Honolulu
1901	19.2	27.7
1902	16.0	23.2
1903	16.1	20.0
1904	16.4	20.8
1905	15.5	17.3
1906	16.1	20.4
1907	17.0	20.0
1908	15.3	20.3
1909	14.9	18.2
1910	16.2	19.7
1911	16.8	22.8
1912	15.0	18.4
1913	15.1	18.5
1914	16.7	21.3
1915	15.5	18.1

MORTALITY FROM SPECIAL CAUSES
1901-1915
(Rate per 10,000 of Population)

Year	Tuberculosis	Typhoid Fever	Leprosy
1901	20.8	6.7	..
1902	17.1	5.6	5.0
1903	18.7	8.7	2.8
1904	21.6	10.3	3.3
1905	17.5	7.2	3.7
1906	20.8	4.2	3.3
1907	18.9	6.9	3.1
1908	20.1	5.9	2.2
1909	18.4	8.0	2.4
1910	17.3	5.8	3.6
1911	19.4	3.9	2.4
1912	17.7	1.9	2.4
1913	16.0	2.4	2.2
1914	18.5	2.5	2.7
1915	15.2	1.8	1.7

MORTALITY BY COUNTIES
1908-1913
(Rate per 1,000 of Population)

Honolulu City and County	16.5
Maui County	16.4
Hawaii County	15.4
Kauai County	11.2

STANDARDIZED MORTALITY BY RACE
1908-1913
(Rate per 1,000 of Population)

Hawaiian	34.4
Japanese	16.6
Portuguese	14.7
Part Hawaiian	13.6
Chinese	11.5

PROPORTIONATE MORTALITY FROM PRINCIPAL CAUSES, BY RACE, 1912-1915

American	Per Cent.	Hawaiian	Per Cent.	Chinese	Per Cent.
Circulatory diseases	19.7	Tuberculosis	14.6	Tuberculosis	13.1
Accident	16.9	Pneumonia	14.2	Circulatory diseases	10.0
Pneumonia	5.7	Circulatory diseases	10.9	Diarrhea and enteritis	9.4
Nephritis	5.7	Diarrhea and enteritis	9.9	Pneumonia	8.6
Tuberculosis	5.4	Nephritis	5.7	Accident	7.2
Early infancy	4.8	Leprosy	4.3	Nephritis	6.0
All other causes	41.8	All other causes	40.4	All other causes	45.7
All causes	100.0	All causes	100.0	All causes	100.0

Portuguese	Per Cent.	Part Hawaiian	Per Cent.	Japanese	Per Cent.
Diarrhea and enteritis	21.0	Diarrhea and enteritis	15.8	Pneumonia	12.5
Pneumonia	10.7	Pneumonia	15.0	Diarrhea and enteritis	11.3
Circulatory diseases	8.7	Tuberculosis	12.0	Tuberculosis	8.0
Early infancy	6.9	Early infancy	8.5	Accident	7.6
Accident	5.8	Accident	4.0	Meningitis	6.5
Tuberculosis	5.4	Circulatory diseases	3.9	Early infancy	5.9
All other causes	41.5	All other causes	40.8	All other causes	48.2
All causes	100.0	All causes	100.0	All causes	100.0

Filipino	Per Cent.	Filipino	Per Cent.	Filipino	Per Cent.
Diarrhea and enteritis	16.4	Beriberi	10.5	All other causes	37.0
Pneumonia	12.6	Early infancy	6.4		
Tuberculosis	11.0	Accident	6.1	All causes	100.0

NOTE.—The above tables give the data represented in the chart on page 6.

CHART II

LEPROSY IN HAWAII

INMATES AND DEATHS OF LEPERS
MOLOKAI, 1881-1915
(Rate per 10,000 Population of Hawaii)

Year	Inmates	Deaths of Lepers
1881	94.4	18.6
1882	83.9	15.2
1883	99.3	19.5
1884	87.1	20.7
1885	80.7	17.3
1886	71.7	12.1
1887	83.0	13.0
1888	118.9	27.2
1889	134.2	16.9
1890	134.8	17.6
1891	122.6	22.5
1892	113.7	15.8
1893	115.9	15.2
1894	109.4	15.5
1895	102.7	13.3
1896	102.3	10.5
1897	91.4	11.6
1898	80.5	8.7
1899	71.0	7.3
1900	63.8	8.7
1901	57.0	10.9
1902	54.1	6.6
1903	52.7	6.1
1904	50.6	6.3
1905	49.4	5.5
1906	47.2	4.8
1907	44.8	4.9
1908	41.8	3.2
1909	37.6	3.5
1910	32.0	4.7
1911	29.5	3.0
1912	29.7	3.1
1913	31.5	2.3
1914	29.3	3.3
1915	27.6	2.7

TYPE OF LEPROSY, MOLOKAI
1901-1913

	Number of Cases	Per Cent.
Anesthetic	327	30.9
Tubercular	384	36.2
Mixed	275	25.9
Not given	74	7.0
Total	1,060	100.0

ADMISSIONS TO MOLOKAI
1871-1915
(Rate per 10,000 Population of Hawaii)

1871–1880	23.2
1881–1890	25.4
1891–1900	10.4
1901–1910	4.5
1911–1915	3.3

LEPERS BY RACE AND SEX, MOLOKAI
JUNE 30, 1915
(Rate per 10,000 of Population)

	Male	Female
Hawaiian	185.6	158.5
Part Hawaiian	71.6	71.6
Portuguese	26.9	11.4
Korean	25.1	0.0
Chinese	17.4	4.4
Spanish	8.8	0.0
Porto Rican	6.7	0.0
Other Caucasian	4.3	4.3
Japanese	2.0	0.0
Filipino	0.0	0.0

APPREHENSION OF LEPERS BY PLACE OF RESIDENCE, 1912-1914
(Rate per 10,000 of Population)

City of Honolulu	3.4
Hawaii County	3.0
Kauai County	2.8
Oahu County (except Honolulu)	1.7
Maui County	1.5

NOTE.—The above tables give the data represented in the chart on page 18.

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